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RURAL SCHOOL SURVEY *of* NEW YORK STATE

EDUCATIONAL ACHIEVEMENT

By

M. E. HAGGERTY, PH.D.

DEAN OF THE COLLEGE OF EDUCATION
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FOREWORD

THE report of this section of the survey is distinctive for the following reasons:

It furnishes an excellent illustration of the value of standardized tests in the study of schools. The facts that have been secured with reference to the reading situation in the rural schools of the State should be invaluable to administrative and supervisory officers and they should also arouse teachers and patrons to the need of securing more adequate results from the work of the schools in this subject. Reading is of basic importance. Not only does it condition progress in other school subjects, but deficiency in it may be a barrier to the intelligent discharge of the duties of citizenship. The elementary school has no more important subject to offer the children and the results should be better than are now being obtained.

The use of the intelligence and standardized tests with such large numbers of pupils through so many grades, and in all sections of the State, should furnish valuable data for those who are interested in the relative effectiveness of rural and urban schools.

The survey of the rural schools of New York State and the printing of this report were made possible through a grant from the Commonwealth Fund.

GEO. A. WORKS, *Director*

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EDUCATIONAL ACHIEVEMENT

CHAPTER I

1. Introduction

WHEREVER education is vital it serves social needs. No school can continue in favor with its supporters when it ignores such needs, and, conversely, any great social interest will sooner or later find expression in the program of studies of educational institutions. Particularly must tax-supported institutions respond to the varying social pressures of a people and, historically considered, a public school curriculum is the organized expression of what the tax-paying population desires its schools to teach.

It is one thing to provide in a school curriculum the necessary means for training children along the lines which society desires. Experience shows that schools often, while making all the necessary formal provisions for such training, fail to achieve the type of finished product desired and intended. It was the function of the Division of Tests and Measurements in the New York survey to make definite inquiry regarding this finished product of the rural schools of the state. It faced not so much the problem of what the schools should teach, as the problem of how well do the schools teach the things which all admit are included in its legitimate teaching program. How well do the pupils in these schools learn the things which by common agreement they should learn?

One method of securing an answer to a question of this sort is to observe the work of the pupils and teachers in the school. Such a method has certain very great advantages, but by almost universal admission the results from such a method are unduly influenced by the personal bias and inaccurate judgment of the observer. It has become common practice, therefore, to supplement such personal observations by standard tests and examinations. The advantage

of such standard tests is that they give objective results which are uninfluenced by the personal judgment of individual observers. Such results lack concreteness, picturesqueness and the lively sense of reality inherent in the direct observation of pupils in action, but they are objectively statable in mathematical terms and thus aid greatly in the objective evaluation of the school product.

Figure 1.—Shaded areas indicate supervisory districts in which testing was done. Figures indicate the numbers of the supervisory district in the counties

2. Scope of Examinations

For the purposes of the survey the state was divided into seven districts. The division was made on a geographical, economic and social basis. Within each of these districts particular counties were chosen and within each county single supervisory districts were selected. It was the intention to select these districts in such a manner as to include all kinds of rural[1] schools and thus to secure a fair and accurate picture of prevailing conditions throughout the state.

[1] The term "rural schools" in New York state means schools in places of less than 4500 population.

The chosen districts lie in the following counties: Cayuga, Clinton, Columbia, Erie, Herkimer, St. Lawrence, Tompkins, Wayne, Westchester, Otsego, and Oswego. In the districts thus selected, the tests were given in every school from the largest and most easily accessible to the smallest and most remote.[1] In addition to tests in these districts, examinations were also given in the consolidated school at Greigsville, Livingston County, and in the junior high schools in Rochester and Buffalo and in the senior high school at Syracuse.

In each school every elementary pupil was examined with one or more tests. In grades one to four tests were given to more than 5000 children. In grades 5 to 8, inclusive, about 6000 and in grades 9 to 12 2500 pupils were tested. In all, about 14,000 pupils in 441 schools were examined.

One kind of test was given throughout the entire examination, namely, a test in silent reading. The importance of this sort of measurement will be discussed later. For grades 1 to 4 the reading examination, Sigma 1, as developed in connection with the Virginia Survey, was used. No other test was given to all primary pupils. In a few schools a group intelligence examination was used. A single test, Reading Examination, Sigma 3, Form B, was given in grades 5 to 12 inclusive. The various parts of this test had been widely used previously but never before in this particular combination. In grades 5 to 8 tests were given also in spelling and in the fundamentals of arithmetic. In the high school, those pupils who were studying Latin and algebra at the time were given tests in these subjects. From grades 3 to 12 inclusive, a general intelligence examination was given as supplementary to the achievement tests, primarily for the purpose of studying the classification of children in the schools, and of checking the efficiency of the schools as measured by certain of the achievement tests. In all these grades, the Delta 2 Intelligence Examination was used, and in addition, Form A of the Miller Mental Ability Tests was given to the high school students.

[1] Director's Note: Every school in seven supervisory districts was included and in the remaining districts all of the schools in a random selection of towns (townships) were included.

3. The Field Work

The field work involved in testing something over 14,000 children was done principally by New York school people. A chief examiner was selected for each of the districts chosen as above stated. Five of the examiners were professors of education or psychology in normal schools, colleges or universities within the state; one was a graduate student at Teachers College, Columbia University, and had had extensive experience in a state department of education in a neighboring state; and a seventh was superintendent of one of the city schools of the state. In order that all might follow exactly the same method of examining, extended directions were written in the form of an Examiner's Manual. This manual gave a complete schedule of the examinations to be given for each type of school, specifying grades to be examined, tests to be used and time allotted to examinations. Appended thereto was a complete list of all the materials the examiner would need in the examinations. Following this schedule, detailed directions were given for the conduct of each particular test or battery of tests. On the back of the "Teacher's Record of Pupils" provision was made for an examiner's record which would show in detail the number of children examined, the grades in which they were found, the types of schools, size of building, length of term and the examiner's comment on the examination in each class and school.

For the purpose of clearing up any obscure points in the manual of directions and the schedule of examinations, and of further standardizing the methods of work, all of the chief examiners were called together at the State Department of Education in Albany for a two-days' training school. At this time the complete manual was studied in detail and all questions as to procedure were carefully ironed out. As a part of this training school, each of the examiners gave tests in the city schools of Albany under the observation of the Director of the Division of Tests and Measurements, and the other members of the training school. Careful check was made of the work of each examiner and a final conference was held to perfect details of work.

Following this central training school, each of the chief examiners called together, at a place which had been appointed previously for the purpose, the individual examiners who were to serve under his

direction.. These several training schools continued for two or three days each, during which time the examiners familiarized themselves with the examiner's guide, and practised giving the tests under supervision in local schools. All of this preliminary training, both for the chief examiners and for their helpers, took place during the week of April 17, 1922. The examinations proper began on Monday, April 24, and were completed in all schools within a period of approximately two weeks from the time of beginning. At the end of the first day of field work each Chief Examiner met his helpers, and following a conference, reported the progress of his work to the Director of the Division. Frequent reports were made by each examiner throughout the period of examination. Upon the completion of the field work each Chief Examiner made a detailed written report upon the work done under his direction, calling attention to unusual conditions affecting the results from any particular school or class. Only such tests are used in this report as were vouched for by these examiners.

4. Scoring, Tabulation, and Interpretation

At the end of the testing period, all materials were shipped to the University of Minnesota where they were scored, tabulated and studied.

In the work of scoring and tabulation, Professor M. J. Van Wagenen rendered very great assistance, directing a considerable part of the work.

The interpretation of the test results is the work of the writer of this volume.

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For the efficient direction of the field work in the several supervisory districts, credit is due to the following persons who acted as chief examiners:

Mr. Paul J. Kruse, Professor of Educational Psychology, Cornell University.

Mr. Mark A. May, Professor of Psychology, Syracuse University.

Mr. L. A. Peckstein, Professor of Psychology, Rochester University.

Mr. W. H. Pillsbury, Assistant Superintendent of Schools, Buffalo, New York.

Mr. R. G. Reynolds, Formerly Assistant Commissioner of Education, Vermont.

Mr. Charles C. Root, Professor of Education, Buffalo State Normal School.

Mr. Allen J. Williams, Superintendent of Schools, Lake Placid, New York.

Whatever dependability is attributable to the actual testing of the pupils is due to the imaginative understanding with which these men grasped the significance of the testing program and the fidelity with which they trained their helpers and actually carried the program through.

To all the persons named and to Professors Van Wagenen and Miller for their assistance in interpretation of results the writer of this report desires to express his sincere appreciation.

CHAPTER II

RESULTS AND RECOMMENDATIONS

FOR the reader who desires an overview of results without the intrusion of details and technical matters, this chapter presents in summary form the more obvious conclusions to be derived from the tests. These conclusions will be given in short paragraphs under the headings of the chapters which follow. Here also will be given such general recommendations as are considered most important in the light of the test results.

Reading Achievements

1. The results of the reading tests indicate that the rural schools of New York state do not succeed in teaching children to read English prose as well as is desirable. Exceptions to this general statement may be made in the case of certain schools and certain districts.

2. In reading ability the primary grades of the New York rural schools score below those of Virginia and North Carolina. Grade 2 of the Virginia and North Carolina schools score 14.5 and 14 respectively while New York schools score 12.7 points. Compared with Norfolk children who score 18 and Wisconsin children who score 20, the inferiority of New York reading achievement is still greater. Judged by the standard norms, grades 2, 3 and 4 are one-half year behind where they should be.

3. Without exception, in all the primary grades, the four-teacher schools exceed the one-teacher schools in Sigma 1 scores.

4. The superiority of the larger schools over the smaller schools is constant throughout the upper grades. The difference in the scores of these two is about equivalent to the progress which New York

pupils make in one year of schooling. The 7th grades of the four-teacher schools, with a median age of 13.5 years, score 70.5 while the 8th grades of the one-teacher schools, with a median age of 14.4 years, make a score of only 65.8.

5. Reading abilities of high school pupils are not adequate to meet the practical needs of every day life. Only those who remain through the 12th grade and graduate really acquire facility in reading.

6. The reading ability of the smaller high schools is, in general, inferior to that of the larger high schools.

Measures of Ability

1. The Haggerty Intelligence Examination, Delta 2, was given to all pupils tested in grades 3 to 12 inclusive. Numerous correlations and other evidences resulting from its wide use in survey and experimental problems show the availability of this intelligence examination for use in predicting, with a high degree of assurance, the success of pupils in school work. Among tests of its type, the data show, Delta 2 has a high rank.

2. The Miller Mental Ability Test, an intelligence examination composed of three tests, was given to all high school pupils. This test has a high correlation with other intelligence examinations, namely, a coefficient of .90 with the average of five well-known tests, and a coefficient well over .80 between each of its two forms and the average of nine other intelligence examinations.

Grouping of Pupils

1. Results of intelligence tests show a very large amount of overlapping from grade to grade.

2. There are children in the lower grades who are intellectually able to do work of one, two, or three grades above the one in which they are placed. There are also those whose intellectual ability renders doubtful the advisability of advancing them to the grades in which they are found.

3. The scores made by high school students indicate that there are many first year students who are equal or superior to second, third, and even fourth year median students.

School Progress

1. A study of mental ages and of chronological age-scores indicate groups of children who are not placed in school according to their abilities. For example, of all the 12-year-olds tested, there are 15 percent of them who have the median ability of grade 8 but who are in lower grades. Likewise, there are 5 percent of the 12-year-olds with 4th grade ability, and 5 percent with 3rd grade ability who are placed higher in the grades. Such data point out that the effect of the school program is to keep the pupils of any age within a narrower range of grade distribution than their intellectual abilities justify.

2. The combined scores of intelligence and reading examinations show about the same amount of overlapping of age-scores and about the same number of cases deserving advancement on the basis of ability but not receiving it.

School Organization

1. A grade connotes a year's work in school. The completion of the 8th grade indicates that pupils have covered eight years of school work and have acquired sufficient information and skill to go on with high school work. The prevailing plan of school organization assumes that a grade is the same throughout the state. The results from the survey show such differences between the achievements of one school and those of the same grade in another school as to render the meaning of grade designations, and of all school organization based on grade units, vague and unsatisfactory.

Intelligence and Achievement

1. In general, an advance in the total achievement scores corresponding to the advance in intelligence scores is found.

2. A comparison of the combination scores of Delta 2 and Sigma 3 with the total achievement scores shows the definite diagnostic value of these two tests.

3. For measuring school efficiency an *educational quotient*, found by dividing the intelligence quotient of an individual into his reading quotient, may be used. This combines chronological age, intelligence, and educational achievement all in a single figure showing what the school is doing with the ability found therein.

4. By the use of the educational quotient it appears that some of the low scoring schools are securing more in terms of the ability of the pupils than are some schools who score high in achievement tests.

American History

Results from Information Test.—1. The median for the 8th grade of the larger rural schools is about ⅓ year's progress short of New York City standards for the 8th grade.

2. The 8th grade median in one-teacher schools is below the New York City school standard for the 7th grade. These one-teacher schools are, therefore, *one year behind* the New York City schools in progress.

3. The larger rural schools, although they are below the New York City achievements, are almost a *full year's progress ahead* of the smaller rural schools.

Results from Thought Test.—1. The eighth grades of four-teacher rural schools score somewhat below the eighth grades of New York City while the eighth grades of one-teacher rural schools achieve less than the seventh grades of New York City.

2. The deficiencies, therefore, amount to a half year's progress in the case of the larger schools and more than a year's progress for the smaller schools.

Spelling

1. Scores for the larger schools and for the 8th grade in the smaller schools compare favorably with the standards for 84 cities throughout the country.

2. The larger schools achieve superior results in spelling.

Arithmetic

1. New York eighth grade scores should ēqual or exceed 18.5 in addition and 18 in multiplication which are Woody (Sept.) standards for that grade.

2. The median in addition for the 845 8th grade pupils in the larger schools of New York was 16.6, a score slightly above the Woody standard for the 6th grade.

3. In addition only one 8th grade median score equalled the Woody standard for grade 7.

4. The median in multiplication is 16.8 which is within one problem of the standard. Since the schools of three counties equal, and the schools of two other counties approximate the standard, the achievement of these larger rural schools in multiplication may be considered satisfactory.

Algebra

1. The Hotz Algebra Tests, based on the type of Algebra prescribed in the New York syllabus, were given to all pupils who had studied the subject three months or more and who, at the time of the test, were studying it.

2. The larger New York schools are achieving satisfactory results in the fundamentals of Algebra.

3. New York scores are higher than those from Virginia, North Carolina, and Kentucky rural schools.

4. The larger New York rural schools exceed both the records of the above states and the Hotz standards in each of the two tests.

5. The larger rural schools of New York compare favorably with junior high schools of Rochester and Buffalo, and with the consolidated school at Greigsville in the teaching of Algebra.

6. The smaller rural high schools of New York, though scoring higher than rural schools of other states, fall below the larger schools in achievement.

Latin

1. Pupils in New York schools show a wide range in their knowledge of Latin.

2. The rural schools of New York, as measured by the vocabulary test, are teaching Latin less well than are good schools generally throughout the country. They do about as well as the schools of Rochester and Griegsville.

3. As measured by the sentence tests, the rural schools of New York score lower than the good schools throughout the country and lower than the schools of Rochester and Greigsville.

The Larger School Unit

1. The larger schools show grade by grade approximately the same median ages as do the smaller schools.

2. As measured by the Haggerty intelligence examination Delta 2, the pupils in the larger schools, grade by grade, have greater capacity to do the work of the school program than have the pupils in the one-teacher schools. The difference in favor of the larger schools is about .7 of the growth which pupils make in one year.

3. The difference shown by grade scores is emphasized by a comparison of median scores made by pupils of the same chronological ages in the two types of schools.

4. The reading examination Sigma 3 confirms the results of the intelligence tests both in grade and age medians.

5. A combination of the above test scores further emphasizes the difference which each shows separately.

6. All the achievement tests except multiplication give similar results.

7. The difference noted above for the upper grades is shown to exist in the lower grades by the results of the sigma 1 tests.

8. The evidence from the New York scores is confirmed by results from similar schools in other states.

9. The Survey results are confirmed by Morrison's study of similar schools.

10. The causes of the difference are not all apparent but it is true that the one-teacher schools have teachers of inferior training.

11. It is obvious from the test results that the one-teacher school is the most serious educational problem facing the State of New York.

Recommendations

It is not the purpose of a testing program such as the one here employed to provide a detailed diagnosis of the causes lying back of the school product revealed. Its aim is to throw light on the general situation in the schools, to suggest the problems deserving further consideration and to recommend the administrative approach to their solution. We may well ask, therefore, what are the outstanding school problems which the test results proclaim as important?

With little hesitancy, it may be said that the problem for first consideration is the improvement of ability on the part of elementary pupils to read English prose. To develop such capacities

is a major function of the elementary school. For the rural schools to fail in it is to fall short in a fundamental job and to leave the young men and women of the smaller towns, villages and the open country handicapped for the great complex game of life, where they must compete alongside of men and women trained in good city schools and whose childhood was favored with better opportunities. Administrative and teaching agencies should rescue the subject of teaching silent reading from its present state of neglect and make it a major aim in the intermediate and grammar grades, and demand as a basic requirement for high school entrance a reasonable attainment in reading skill.

Improvement in reading teaching must be begun in the earliest grades, because, as the tests show, the reading deficiency exists even in grades one, two and three. It must be continued throughout all the grades and into the high school. Thus, naming the problem of reading as a basic aim does not give the technic for its solution. This must come as the result of the experimental study of the problem in the schools concerned, the application of known methods the value of which has been experimentally determined, and the professional vigilance of teachers and of supervisory officers. All of these events will surely follow if the enormity and importance of the problem are clearly grasped.

Without doubt, the largest single potentiality within the state for meeting the need thus made evident lies in the State Department of Education. Reference is not here made to its legal status, important as that is. Its eminence for educational leadership is rather in mind. No other agency can so effectively define educational problems, or exert so wide an influence toward their solution. If this Department will but stress anew this basic function of American schools, that act will, in itself, exert a stimulating influence of wide scope; if it will define the necessary technique for improving silent reading in the rural schools and set acceptable standards of achievement in terms of objective measures, that will be a still more important step; and if it can go further and lend its direct supervisory assistance to local schools, that will be better still.

It is not to be inferred that the State Department of Education is now indifferent to this problem. The recommendation here made is

intended to support all effective work now in progress and to stress the need for an extension of activity in this direction.

Of special promise in this field is the recent creation, within the Department, of the position of Specialist in Educational Measurements. The function of such a specialist is not confined to giving advice to school people as to the quality of tests and the methods of their use. These are important matters, but remedial measures must follow diagnosis, and the giving of tests must be followed by constructive assistance in school reorganization and teaching technique. The State Department has so conceived this position and has already rendered great service to the schools of the state. It needs increased financial support that it may make a direct attack on this reading problem.

But teachers and local school administrators are the final agencies in the solution of the reading problem. They can solve the problem for their local schools whenever they realize its importance and strive for the necessary technique. Many of them are already doing it, as is evidenced by the excellent results from some schools.

A second outstanding matter for recommendation is the situation in American history teaching. The importance of history as a fundamental factor in the elementary program will be stressed later. The results shown by the survey tests combine with the very great importance of the subject, to make the teaching of history one of the crucial problems confronting the rural schools. Nor will the problem be solved by revision of syllabi and Regents examinations. There must be a greater contact of classroom teachers with persons who know history teaching problems, whether such masters of technique are in the supervisory force of local schools, in the State Department of Education or entirely outside the school system. The facts of United States history, the principles of democratic government, and an understanding and appreciation of American institutions can be taught effectively in the rural schools. Supervision in the sense of helpful assistance in local teaching problems is the thing needed. Such supervision implies not merely the making of a history curriculum and the setting of objective standards of accomplishment, but also the training of teachers in service, and direct assistance, upon call, in classroom instruction. Adequate

provision, both in local school systems and in the State Department for such supervision, is urgently recommended.

A third recommendation is based upon the possible use of intelligence and achievement tests in school supervision.

Numerous schools and systems of schools within the state have already made extensive use of tests and, as already noted, the State Department has established an agency for promoting this type of work. The continuance and extension of this work both locally and through the state organization are to be recommended. Such work should be under the direction of persons of adequate training, experience, and judgment. The indiscriminate use of tests by immature, untrained, and inexperienced teachers or other school officers is to be discouraged, as likely to do more harm than good. The issues at stake are great and require expert service. It should be provided in generous measure.

The services which such agencies should seek to render are as follows:

(*a*) The creation of objective standards of accomplishment for pupils of particular ages and school grades in the major subjects of the school curriculum.

(*b*) The determination of objective standards of school organization in terms of school attainment.

(*c*) The better grouping of pupils for instructional purposes.

(*d*) The development of the teaching technique essential to the achievement of the desirable standards noted above.

(*e*) The continuous revision of curricula in the light of experience and of general social and educational progress.

(*f*) The development of special curricula, special classes, and specialized methods wherever needed.

The general program for such service involves bulletins, conferences, visitation and objective measurement.

A little used means for improving the conditions in local schools lies in the normal schools of the state and in the departments and colleges of education in state colleges and in other educational institutions. As already noted, these institutions made a signal contribution to the work of the survey. They can and should continue to render some direct service to the schools. Properly adjusted to

work of this type, these higher institutions would increase the amount of expert service available for supervisory uses within the state enormously. Local school officers and the State Department of Education should take the initiative in inviting such co-operation from these educational institutions.

Nor would the schools be the only ones to profit by such co-operation. More direct contact between actual school conditions and the teacher-training agencies is everywhere needed. Properly arranged, such contact will better define the problems of teacher-training, will quicken the study of educational questions, and will vitalize the teaching in colleges and normal schools.

A final recommendation concerns the size of the school unit. Practically every inference to be derived from the test results points to the advantage of the larger school unit. The existing one-teacher school is the most unsatisfactory educational institution in New York state. Compared to the best schools in the larger communities, the one-teacher school is across the world. This fact the patrons of these schools should realize, and in behalf of the welfare of their own children, they should demand from the state an adequate provision for consolidation, and adequate provision means adequate financial support as well as satisfactory organization. Less than this, the rural citizen cannot accept without proving recreant to the interests of the oncoming generation of rural boys and girls, and recreant to the future of agricultural development and of life in the open country.

CHAPTER III

READING

The Problem of Illiteracy

IF THE entire population of New York who are ten years old and over were placed in a single file, the line would reach nearly five thousand miles. If one were to pass down this line, every twentieth person he would meet would be unable to write his own name.[1] If these half million illiterates were segregated into a similar line, it would stretch across the state from New York City to Utica, a distance of 240 miles. Among the native-born whites the proportion of illiterates is one-half of one percent while it is fourteen percent among the foreign-born who were living in the state in 1920.[2]

It is clear, however, that the ability to write one's own name, important as it is, is no very adequate educational achievement. If a person is to participate in the social life of American democratic society in any real way, it is necessary for him to read the English language. Nor is a mere elementary reading knowledge, such as is attained by primary children, sufficient. The problems of economics, of politics and of religion are discussed in periodicals and books which primary children cannot read. The ability to read intelligently the daily papers, simply written as they are, is considerably in excess of the achievement of primary children. In view of these considerations it would appear that census figures for illiteracy are somewhat illusory. They suggest a better condition than actually exists. If the census definition may be accepted as a criterion for illiteracy, then there should be recognized a condition of *near-*

[1] The definition of *illiteracy* used by the United States Census Bureau is inability to write one's own name.

[2] Figures are from the Fourteenth Census (1920).

illiteracy which, because of its great extent, is of more concern than illiteracy itself.

Near-illiteracy and the Army Examinations

No better evidence of the amount of near-illiteracy which exists throughout the country can be obtained at this time than that revealed by the army intelligence examinations. The bearing of these examinations on the problem of public education in the state of New York are of sufficient importance to justify a word of detail. "Group Examination Alpha" was designed for men who could read the English language; the other, "Group Examination Beta," was intended for illiterates or non-English reading soldiers. The Alpha examination is sufficiently simple that it can be given to pupils in the fourth and fifth grades of the public schools. Yet despite the general simplicity of the Alpha test, it was found necessary to examine 24.9 percent of recruits with the Beta test. In general it may, therefore, be said that one-fourth of America's young men between the ages of 21 and 31, who were taken in the army draft, cannot read the English language as well as a fourth or fifth grade child in the public schools.

These figures, taken from the Memoir of the National Academy of Science on "Psychological Examining in the United States Army," are for the country as a whole. For the state of New York, the Memoir shows that 16.6 percent of the men were unable to read the Alpha examinations, and that thirty-one percent of the recruits from New York City were required to take the Beta examination. Less than two percent of these were rated as feeble-minded, leaving 29 percent who were illiterates, or near-illiterates, and who had sufficient intelligence that they might have learned to read under adequate educational conditions. Two percent of these were unable to speak English, nine percent were able to speak English but could not read and write it, and twenty percent were able to read and write somewhat but not sufficiently well to read sentences such as the following:

> "*Get the answers to these examples as quickly as you can.*"
> "*It is wise to put some money aside and not spend it all, so that you may prepare for old age and sickness.*"

To put the matter succinctly, it may be said that only 69 out of every 100 men whom New York City sent to the army were able to read English with sufficient facility to enable them to read the newspapers or to understand army orders printed in the language of the country.

It seems pertinent to present these facts concerning near-illiteracy because the people of the state of New York may legitimately expect their system of public education to remedy the situation. No single obligation rests so heavily upon the public schools as that of teaching the young people of the state to read the English language —the language of American politics and government, the language of American commerce and industry, the language of American literature and of American social ideals. No achievement in other fields will compensate for failure here, and no mere knowledge of the simple words and sentences of the primary school readers will suffice. Young people should master the words and the language structure involved in English sentences and paragraphs which are necessary to mature thought. For such an achievement on the part of its citizens the state can afford to pay any necessary sum of money. To be satisfied with less is perilous to its democratic institutions.

These and like considerations which argue for increased efficiency in all schools, apply with increasing force to educational improvement in rural education. Within a generation, the economic and social problems of agricultural communities have been transformed. Formerly, the problem of the farmer was primarily to find land, to rid it of the obstacles to cultivation and to plant it, tend it and to harvest the produce it yielded. These problems of production are to-day tremendously complicated with the problems of marketing which are no longer local. On the contrary, the prices of fruit and grain in central New York are determined by the conditions of living in the city of New York, and these in turn by the conditions of production in Europe and Asia and South America. The intelligent farmer in New York State can no longer be concerned with the conditions of his own farm, his own county or his own state, merely. In his struggle for a living and for the accumulation of wealth he is affected by conditions which are world-wide and vastly beyond the

range of his personal experiences. If he is not to be the mere tool of these world-wide economic forces, if he is to adjust his own life to them and use them for his own welfare, he must understand them, and to understand them he must read the books, magazines and newspapers in which they are discussed. The capacity for intelligent reading of such literature implies a training in the mechanics of reading greatly in excess of that needed a generation ago. The successful farmer is to-day a business man, an economist, a sociologist and a practical scientist. He can be none of these things satisfactorily in New York State in the year 1922 without a facile command of English prose. His imperative needs as a farmer, therefore, lay upon his public schools an inescapable burden of teaching the reading of English prose up to the levels of these needs.

Reading English Prose

With a view to throwing light upon the efficiency of the rural schools in meeting this problem of near-illiteracy and in developing reading ability on the part of the pupils in these schools, a series of tests in silent reading was given. In all the upper grades and high schools of the selected supervisory districts the pupils were examined with a battery of three tests. The first of these tests is designed to measure the pupil's grasp of English vocabulary. The words for the tests were selected from those occurring in school readers designed for the upper elementary grades. A large number of such readers have been examined, and from these the selections most frequently used have been chosen. These most commonly used selections have been studied for vocabulary and the words have been tabulated for frequency of occurrence. These words have then been made into tests of the type shown below:

Test 1.—Vocabulary

Draw a line under the best definition for each word.

1. *labor* (look sad, to work, liquor, to read) 1
2. *victory* (fight, to win a battle, sign, to exclaim) 2
3. *captain* (wears cap, person who commands, tall man, master) 3
4. *cabin* (small house, room, to peep, a ship) 4
5. *tea* (drink made from leaves, afternoon party, food, letter) 5
6. *idle* (lazy, quiet, not to work, dreaming) 6
7. *route* (way, to be traveled, march, pass, course) 7
8. *abundance* (plenty, multitude, fruitful, several) 8

9. *artificial* (artful, not natural, to narrate, crafty) 9
10. *embark* (troops, fortune, to board a vessel, to undertake) 10
11. *courtesy* (humor, politeness, ideals, training) 11
12. *shriek* (to laugh, to seize, to spoil, to scream) 12
13. *chivalry* (kindness, a gallant deed, to be fair, just) 13
14. *pamphlet* (a disease, a publisher, a writer, a small paper book) 14
15. *pierce* (an enemy, a passage, a mystery, to penetrate) 15
Etc. to 50 words.

Eighty percent of the words used in this entire test are given by Thorndike in his list of the 10,000 commonest words in the English language. All of the words in the first half of the test are in Thorndike's list. The harder and less frequently occurring words are near the end of the test.

The source from which the words are selected and the presence of this large proportion in the Thorndike list are conclusive evidence of the important part which they play in a usable reading vocabulary.

TEST 2.—SENTENCE READING

Draw a line under the right answer to each question.

1. Are shingles used on houses? ..... YES NO
2. Are all fabrics made of wool? ..... YES NO
3. Would you trust a dishonest character? ..... YES NO
4. Are all animals kept in captivity? ..... YES NO
5. Are some orphans adopted by friends? ..... YES NO
6. Is all exercise violently taken? ..... YES NO
7. Should valuable documents be preserved? ..... YES NO
8. Are the opponents in controversy always enemies? ..... YES NO
9. Is the protection of citizens desired by most mayors? ..... YES NO
10. Do the follies of children ever astound their parents? ..... YES NO
11. Is counterfeited money coveted by honest folk? ..... YES NO
12. Are victorious persons sometimes accorded honor? ..... YES NO
13. Do travelers occasionally perish in a severe climate? ..... YES NO
14. Do all inland cities have marvelous dwellings? ..... YES NO
15. Do manuscripts convey information? ..... YES NO

TEST 2.—SENTENCE READING

The second test of the series is a sentence reading test, the items of which are chosen from the same source as were the words for the vocabulary test. Ninety-eight percent of all the words in the first half of the test occur in the Thorndike list and 92 percent of all the words of the test are to be found there. The sentences into which these words are combined do not involve all the factors of sentence structure, but they do require the pupil to understand words in certain of their relations. The first ten sentences of the test are

given above. The succeeding sentences increase in difficulty so that but a small percent of the pupils will answer all the later questions correctly.

Test 3.—Paragraph Reading

The largest space in the battery of tests was devoted to a "Paragraph Reading Test," of which the following is the easiest sample:

I.

They went across the hall to a door at the back of the house. It opened before them and disclosed a long, bare, melancholy room, made barer still by lines of desks. At one of these a lonely boy was reading near a feeble fire; and Scrooge sat down upon a form, and wept to see his poor forgotten self as he had used to be.

1. Underline the words telling where the door was:
   in the front
   at the side
   in the rear
   by the porch

2. Underline the false statements:
   The room was cheery.
   The room had desks in it.
   The room was filled with beautiful pictures and flowers.

3. Check one of the following statements which is true:
   a. There were many boys getting their lessons.
   b. One lonely lad was reading by a fire.
   c. Only one person crossed the hall.

4. Underline the statements which are true:
   Scrooge cried.
   Scrooge was sorry for himself.
   Scrooge laughed aloud.

This paragraph is from the Christmas Carol, by Dickens, a prose narrative common to a large number of school readers and familiar to all readers of English prose. The succeeding paragraphs of the test were from well-known writings of Hawthorne, Eliot, Howells, Harris, Barlow and Washington.

These three tests, with properly adapted fore-exercises for each test and explicit directions, were combined into a single examination requiring in all about forty minutes of the pupil's time.

Statistical Characteristics of the Examination

The maximum combined score possible in the three tests is 146 points, distributed as follows: Vocabulary 50 points, sentence reading 40 points and paragraph reading 56 points. The last score is obtained by multiplying the number of questions, which is 28, by 2.

How well this reading test distributes the individuals in a school group may be seen by a study of Table 1 and Figure 2, which repre-

Table 1.—Reading: Sigma 3—Form B. All Schools—Grades 5–12. Distribution of Scores and Percentages for Each Score

Score	Four rooms 5–12	One room 5–8	Totals	Percent
0	4	2	6	.1
1–5	13	15	28	.4
6–10	18	28	46	.7
11–15	40	52	92	1.5
16–20	58	75	133	2.1
21–25	67	95	162	2.6
26–30	113	104	217	3.5
31–35	135	130	265	4.2
36–40	167	141	308	4.8
41–45	201	153	354	5.6
46–50	200	117	317	5.0
51–55	195	131	326	5.1
56–60	193	120	313	5.0
61–65	199	125	324	5.2
66–70	244	114	358	5.7
71–75	258	98	356	5.7
76–80	249	93	342	5.4
81–85	244	95	339	5.4
86–90	241	83	324	5.2
91–95	245	94	339	5.4
96–100	221	49	270	4.3
101–105	180	56	236	3.8
106–110	173	35	208	3.3
111–115	171	19	190	3.0
116–120	155	20	175	2.8
121–125	97	3	100	1.6
126–130	66	2	68	1.0
131–135	53	1	54	.9
136–140	29	..	29	.5
141–145	10	..	10	.2
146–150	1	..	1	.01
Total.....	4,240	2,050	6,290	100

sent the scores for more than 6000 pupils from grades 5 to 12, inclusive, in schools of all types. The short vertical lines at the bottom of this figure represent the median scores for the several grades for which they are numbered.

It is, of course, not sufficient that an examination should show a good distribution of individuals. It is necessary that the rating which any particular individual receives from a test should be a dependable rating; *i. e.*, one which he would receive at any time

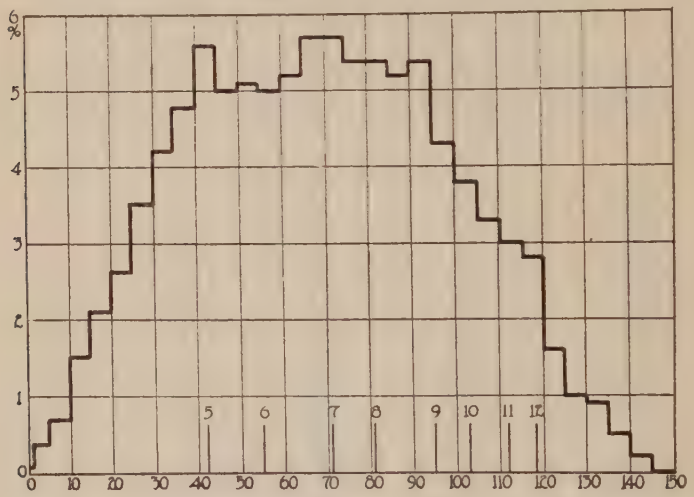

Figure 2.—Reading examination. Sigma 3, Form B. All schools—grades 5–12. 6290 pupils. Surface of frequency. Showing percentage of pupils making each score. Short verticals represent grade medians

the test is given. In other words, the reliability of the test should be such that any single trial of it is dependable. This Sigma 3 examination meets this criterion with a high degree of satisfaction, the coefficient of correlation[1] on two trials of the same form of the examination being about .89.[2]

The validity of the examination as a measure of reading achieve-

[1] Unless otherwise stated, all coefficients of correlation reported in this volume are calculated by the Pearson Products-Moment method: $r = \frac{\Sigma x \cdot y}{\sqrt{\Sigma x^2} \cdot \sqrt{\Sigma y^2}}$

[2] Haggerty, Reading Examination, Manual of Directions, 1921, pp. 41ff.

ment will be further discussed in Chapter IV. For the present it will be assumed that it does measure a form of skill and achievement which is a highly desirable product of school training and which may be designated *reading ability*.

Analysis of Scores

The scores combined in Table 1 are analyzed in Tables 2 through 6, 10 through 12 and 17 through 19 for the several grades in the several types of schools. The distribution of approximately 2800 children, in grades 5 to 8 of 4-teacher elementary schools, is shown in Table 2. In Figure 3 are given the percentile graphs for these four grades. The median score for the eighth grade is 81 points. The best score achieved by any eighth grade pupil in any school is 135 points. Eight pupils achieved 120 or higher and nearly twenty percent of all eighth grade pupils score above 100. These pupils read well—even better than the average of first year high school pupils, as may be observed in the table of median scores, page 58, Table 12. Persons who reach this mark can read with fair understanding current newspapers, periodicals and ordinary books.

It is obvious, however, that there are large numbers of the eighth grade group who cannot read so well. Forty pupils, or about 5 percent of the total, score as low as the median of the fifth grade and one-fourth of all score below 66, or slightly above the median of the sixth grade.

The figures used to express these low achievements do not convey any lively picture of the real situation. Concreteness may be given by detailed examples of the parts of the test upon which the pupils failed. Such a detailed study of the pupils' responses shows that one pupil in every seven did not know that "manuscripts convey information." Either he was ignorant of the meaning of one of these three words, or he was unable to see the relation of the words when combined in the sentence. About one-fourth of all eighth grade pupils asserted that, "All laws are enacted with facility." Either the words were unknown or the pupils were ignorant of the processes of legislation. One in every three pupils did not know that "a knave" is "a rascal" and a larger number did not know that "to beguile" means "to deceive." Twenty-eight in every hundred denied

that "Embezzlers practice fraudulent activities," and twenty-seven in every hundred believed that "Imbeciles have high intelligence."

It need not surprise one if a fourteen-year-old boy does not know

TABLE 2.—READING: SIGMA 3, FORM B. FOUR-TEACHER ELEMENTARY SCHOOLS. GRADES 5–8. DISTRIBUTION OF SCORES BY GRADES. MEDIAN SCORE AND MEDIAN AGE FOR EACH GRADE

Score	Grades			
	5	6	7	8
0	3	1	..	..
1–5	11	2	..	..
6–10	14	4	..	..
11–15	30	10	..	1
16–20	40	20	1	1
21–25	47	20	4	..
26–30	77	33	3	..
31–35	63	53	13	3
36–40	74	57	25	12
41–45	**84**	54	39	22
46–50	68	52	47	27
51–55	54	**62**	28	35
56–60	36	58	39	41
61–65	29	58	37	60
66–70	29	50	54	67
71–75	29	44	**61**	65
76–80	23	31	49	77
81–85	7	35	42	**75**
86–90	7	20	39	67
91–95	5	15	39	77
96–100	7	13	20	54
101–105	1	5	7	46
106–110	..	5	7	34
111–115	..	7	11	22
116–120	1	2	5	20
121–125	..	..	1	5
126–130	..	..	..	2
131–135	..	..	..	1
Total	739	711	571	814
Median score	42	55	71	81
Median age	11.7	12.6	13.5	14.3

the meaning of "implacable," "assiduity" or "bantering," but "adjusted," "liberated" and "courtesy" should certainly be instantly understood by any upper grade pupil who sees them. Simi-

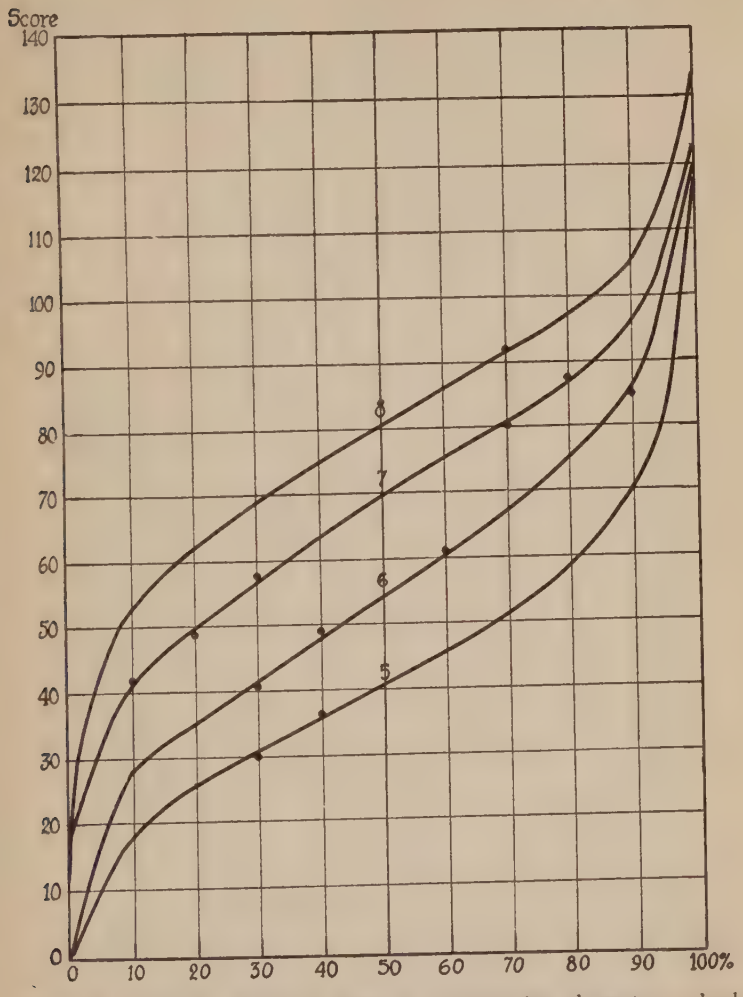

Figure 3.—Reading: Sigma 3, Form B. Four-teacher elementary schools. Grades 5–8. Percentile graph of scores by grades

larly, he should know that "Loud boastings give offense," that "Magnanimous persons are not destructive," and that "An officer

TABLE 3.—READING: SIGMA 3, FORM B. THREE-TEACHER SCHOOLS. GRADES 5–8. DISTRIBUTION OF SCORES BY GRADES. MEDIAN SCORE AND MEDIAN AGE FOR EACH GRADE

Score	Grades				Total
	5	6	7	8	
0	..	..	..	..	..
1–5	1	..	..	..	1
6–10	3	..	..	..	3
11–15	2	..	..	..	2
16–20	3	1	..	..	4
21–25	7	2	..	..	9
26–30	11	5	2	..	18
31–35	15	1	3	..	19
36–40	**11**	2	4	1	18
41–45	17	4	3	3	27
46–50	10	**9**	4	6	**29**
51–55	6	..	6	4	16
56–60	3	7	2	1	13
61–65	6	2	**5**	6	19
66–70	5	2	7	3	17
71–75	..	..	5	**3**	8
76–80	1	1	2	3	7
81–85	2	3	1	4	10
86–90	..	.	1	5	6
91–95	1	..	..	3	4
96–100	1	1	2	1	5
101–105	..	..	..	3	3
106–110	..	..	..	..	..
111–115	..	1	1	1	3
116–120	..	..	1	1	2
121–125	..	..	..	..	..
126–130	..	..	..	..	..
131–135	..	..	..	..	..
136–140	..	..	..	..	..
Total.....	105	41	49	48	243
Median score...	40.4	49	61.5	71	49.5
Median age.....	11.9	11.9	13.6	14.6	..

may arrest a vagrant youth." Further, he should understand when an author says "He slipped away from the blaze and bustle of the station down the gloom and silence of the broad canal," and further reinforces this idea by such expressions as "dark waters," "here and

TABLE 4.—READING: SIGMA 3, FORM B. TWO-TEACHER SCHOOLS. GRADES 5–8. DISTRIBUTION OF SCORES BY GRADES. MEDIAN SCORE AND MEDIAN AGE FOR EACH GRADE

Score	Grades				Total
	5	6	7	8	
0	..	..	..	..	..
1–5	1	1	..	..	2
6–10	5	..	..	..	5
11–15	9	..	..	..	9
16–20	9	1	1	..	11
21–25	10	2	2	..	14
26–30	**19**	7	3	..	29
31–35	10	5	2	2	19
36–40	8	5	5	1	19
41–45	7	8	8	5	**28**
46–50	4	**6**	2	2	14
51–55	3	9	**13**	4	29
56–60	1	6	6	3	16
61–65	2	8	2	4	16
66–70	1	3	6	4	14
71–75	1	3	2	**5**	11
76–80	..	1	1	3	5
81–85	..	..	2	6	8
86–90	..	..	3	2	5
91–95	..	..	1	4	5
96–100	..	1	1	6	8
101–105	..	..	1	..	1
106–110	..	..	..	1	1
111–115	..	..	..	1	1
116–120	..	..	..	..	..
121–125	..	..	..	..	..
Total	90	66	61	53	270
Median score	28.9	49.3	53.9	72.5	45.8
Median age	11.7	12.7	13.9	14.4	..

there a lamp" and "uncertain glimmer" that he is not describing a "very light" scene.

TABLE 5.—READING: SIGMA 3, FORM B. ONE-TEACHER ELEMENTARY SCHOOLS. GRADES 5–8. DISTRIBUTION OF SCORES BY GRADES. MEDIAN SCORE AND MEDIAN AGE FOR EACH GRADE

Score	Grades			
	5	6	7	8
0	..	2	..	..
1–5	14	1	..	..
6–10	22	5	2	..
11–15	37	15	3	..
16–20	48	24	6	3
21–25	56	34	7	1
26–30	64	42	12	1
31–35	**59**	45	20	8
36–40	55	57	19	20
41–45	41	**48**	35	9
46–50	27	40	37	18
51–55	30	34	**28**	22
56–60	13	35	35	31
61–65	11	24	24	35
66–70	6	13	25	**23**
71–75	2	17	10	30
76–80	4	7	18	29
81–85	1	3	12	27
86–90	1	6	11	13
91–95	1	4	6	9
96–100	1	2	11	3
101–105	..	3	2	5
106–110	..	2	5	3
111–115	..	..	..	2
116–120	..	1	2	..
121–125	..	..	1	1
Total	493	464	331	293
Median score	32	42	55	66
Median age	11.9	12.3	13.4	14.4

He should know when an author describes his "niece" as "under twenty" and "a housekeeper past forty" that the niece is younger

than the housekeeper; and that when an author says, "The basis of our political systems is the right of the people to make and to

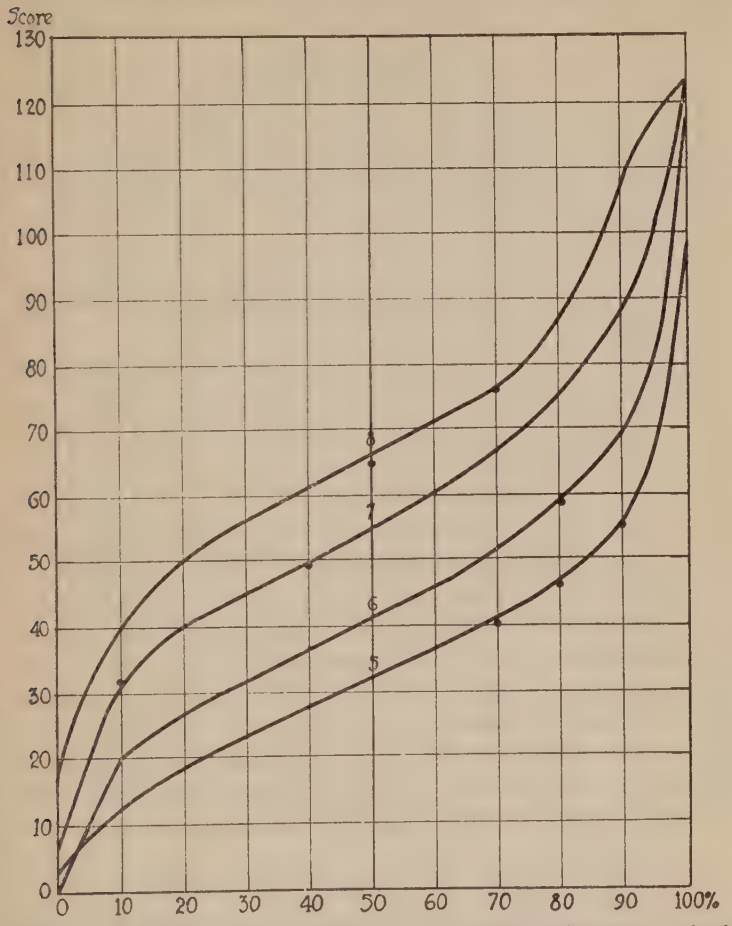

Figure 4.—Reading: Sigma 3, Form B. One-teacher elementary schools. Grades 5–8. Percentile graph of scores by grades

alter their constitution of government," that he does not assert that, "The people have no right to change the constitution of their government."

Yet errors of the type implied are so frequent that the only fair conclusion from the results of the tests is that the reading ability of the eighth grade pupils is much below what it should be. Similar details could be multiplied at length but these are sufficient to show the character of the errors which are responsible for the low scores. The number of pupils who are able to interpret properly the straightforward English prose of Dickens, Eliot, Howells, Scott and Washington is astonishingly small. Fifty-seven percent of the eighth grade pupils failed to give correct answers to questions based on Washington's Farewell Address.

It should be kept in mind that the scores under discussion are for children in the final months of their elementary school course. There is little likelihood that they will at all improve in reading ability unless they go on to high school the following year. For all pupils who do not go on to high school the scores made in this reading test represent the maximum they will achieve in school. In consonance with the laws of forgetting, there is fair certainty that these abilities will deteriorate when the children are no longer in school and in daily contact with books.

That these eighth grade scores represent a fairly correct picture of the reading achievements of the elementary schools is evident from an examination of the lower grade scores as given in Table 2 and the percentile graphs in Figure 3. Each successive lower grade is correspondingly lower than that of the grade above. Grade seven is ten points below grade eight, grade six is sixteen points below grade seven and grade five is thirteen points lower still. This latter score means that in general the average fifth grade pupil could mark correctly 20 of the 50 words in the vocabulary test, 15 of the 40 sentences and 10 of the 28 paragraph questions.

The Smaller Rural Schools

The foregoing figures are primarily for the larger rural schools, *i. e.*, elementary schools having four or more teachers. In general, these schools are superior in reading achievement to the smaller schools, as may be seen by referring to Table 6. The eighth grade pupils in the one-teacher schools, of which the State of New York has such a large number, read less well than do the seventh grade

pupils in the larger schools. The number of these eighth grade pupils is not large—only 293 in all. They are, however, all the pupils found in grade 8 of the one-teacher schools in all the supervisory districts on the day the examinations were given. This median score must, therefore, be taken as the correct measure of reading achievement in schools of this type.

TABLE 6.—READING: SIGMA 3, FORM B. ONE-, TWO-, THREE-, AND FOUR-TEACHER ELEMENTARY SCHOOLS IN ALL COUNTIES. FOUR-TEACHER SCHOOLS INCLUDE ALL SCHOOLS WITH FOUR OR MORE TEACHERS. MEDIAN SCORES AND MEDIAN AGES FOR GRADES 5–8

Types of schools	Grades							
	5		6		7		8	
	Score	Age	Score	Age	Score	Age	Score	Age
One-teacher	31.5	..	41.7	..	55.3	..	65.8	..
Two-teacher	.. 28.9	11.9 ..	.. 49.3	12.3 ..	.. 53.9	13.4 ..	.. 72.5	14.4 ..
Three-teacher	.. 40.4	11.7 ..	.. 49	12.7 ..	.. 65.5	13.9 ..	.. 71	14.4 ..
Four-teacher	.. 41.6	11.9 ..	.. 55	11.9 ..	.. 70.5	13.6 ..	.. 80.7	14.6 ..
	..	11.7	..	12.6	..	13.5	..	14.3
Norm	31		50		68		76	

The superiority of the larger schools is constant, the difference being about equivalent to the progress which New York pupils make in one year of schooling. In Table 6, showing only the medians for the two types of schools, it is apparent that sixth grade achievement of the smaller schools is about equal to fifth grade achievement in the larger schools and so on throughout the upper grades.

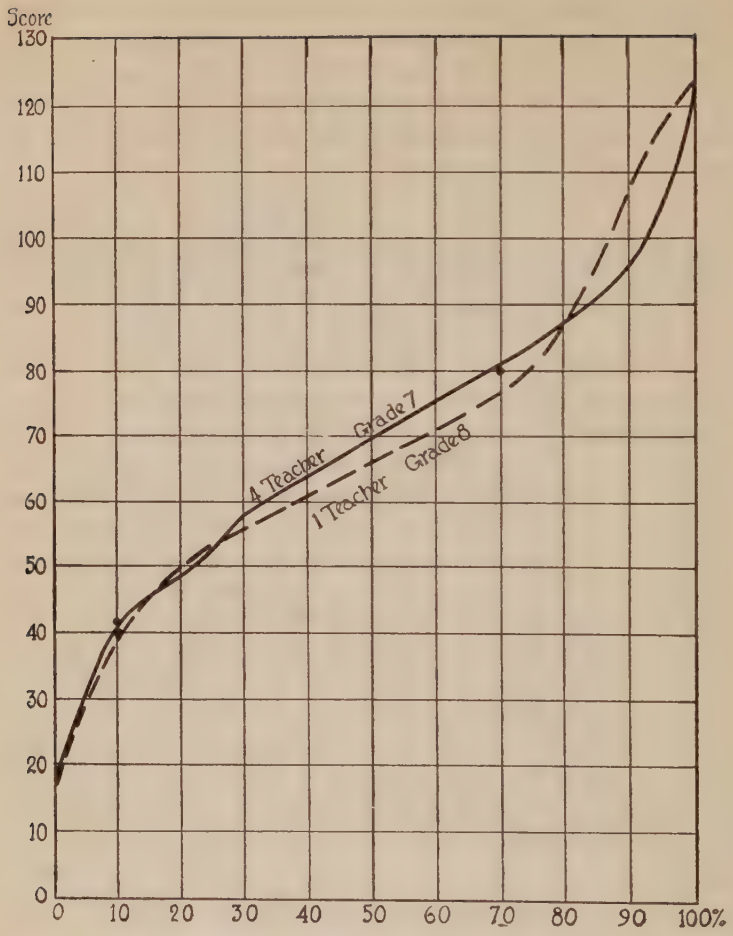

Figure 5.—Reading: Sigma 3, Form B. One-teacher elementary schools, Grade 8; and four-teacher elementary schools, Grade 7. Percentile graph

Elimination in Smaller Schools

The disadvantage of the smaller schools is aggravated by the fact of greater elimination of pupils in these schools. The age-grade distributions for the elementary schools examined in the survey are

given in Tables 7–8. More than nine thousand pupils are represented in these tables, about 40 percent of whom are in the one-teacher schools. The median ages for the two groups of schools

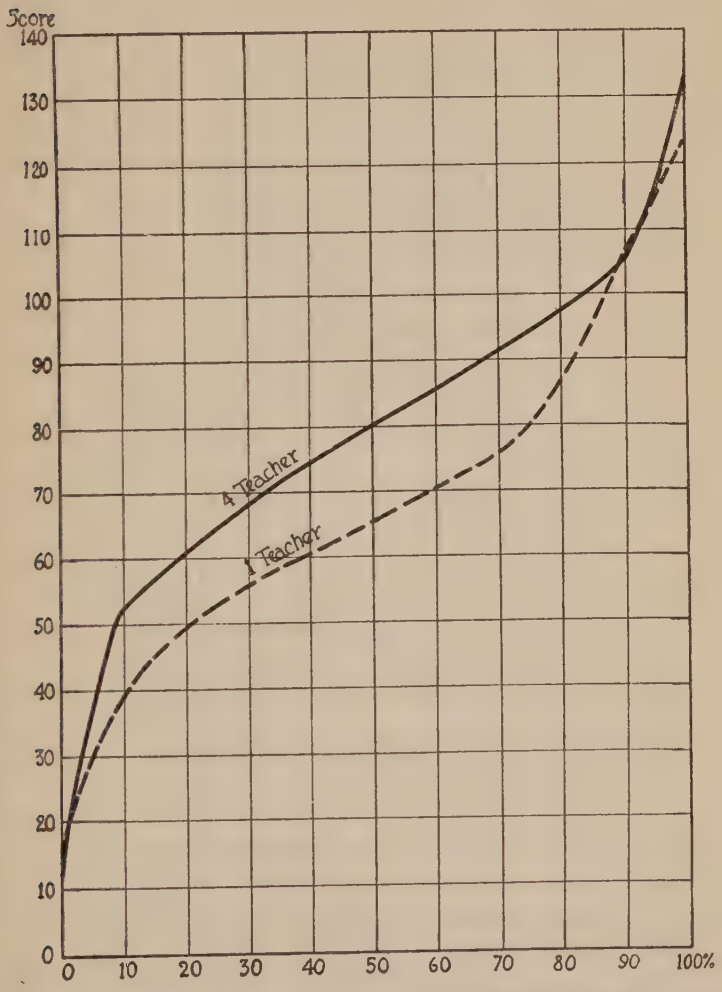

Figure 6.—Reading: Sigma 3, Form B. One-teacher elementary schools, Grade 8; and four-teacher elementary schools, Grade 8. Percentile graph

which are given in Table 9 show almost no variation from one type of school to the other, the difference usually being less than two

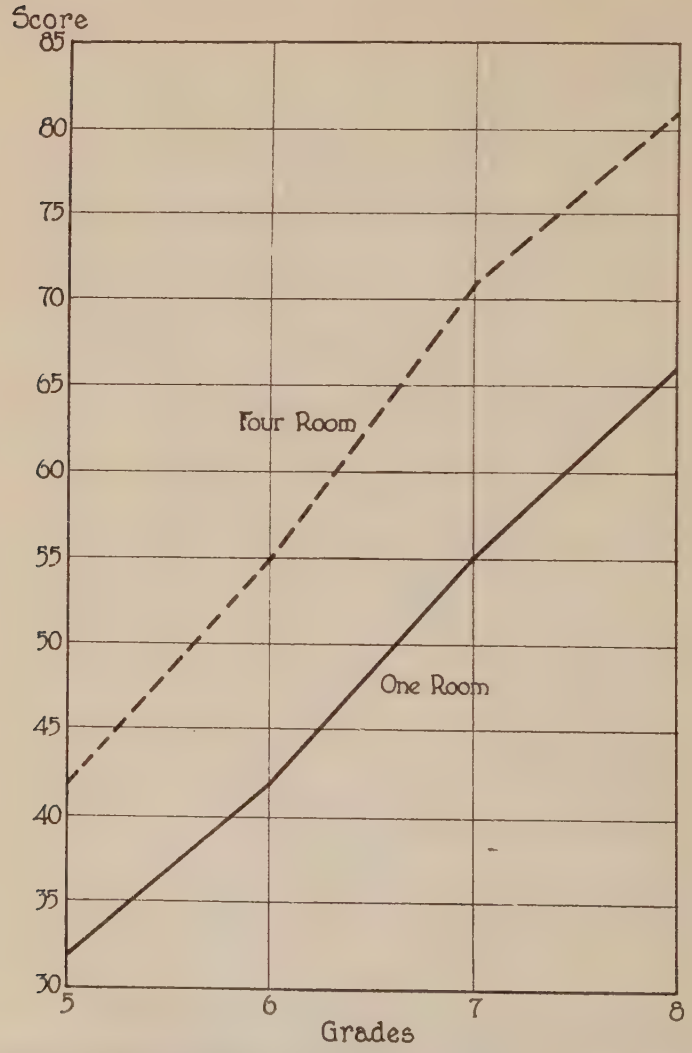

Figure 7.—Reading: Sigma 3, Form B. One- and four-teacher elementary schools. Grades 5–8. Median scores by grades

months. Almost invariably, however, the difference, slight as it is, is in favor of the larger schools. In elimination, the two types of schools differ radically. The larger schools have 778 pupils in the first grade and maintain approximately this number up to the end of the sixth grade. Even near the end of grade 7 there are 80 percent as many pupils in that grade as were found in grade 1 and the

TABLE 7.—AGE-GRADE DISTRIBUTION OF ALL PUPILS TESTED IN FOUR-TEACHER SCHOOLS IN CERTAIN SUPERVISORY DISTRICTS. ALSO MEDIAN AGES PER GRADE AND PERCENT EACH GRADE ENROLMENT IS OF ENROLMENT IN GRADE 1

Age	I	II	III	IV	V	VI	VII	VIII
4	..	..	..	..	..	..	..	..
5	49	..	..	..	..	..	..	..
6	300	39	1	..	..	..	..	..
7	**243**	182	42	2	..	..	..	..
8	129	**232**	233	31	1	..	..	..
9	32	125	**248**	216	36	..	..	..
10	16	55	120	**230**	171	29	6	..
11	5	15	55	151	**200**	206	25	2
12	2	4	24	72	125	**249**	169	55
13	2	7	11	51	83	143	**181**	197
14	..	1	2	18	45	90	157	**256**
15	..	..	3	5	5	34	72	131
16	..	..	1	1	1	9	12	51
17	..	..	1	..	..	1	1	14
18	..	..	..	..	..	..	..	4
Total	778	660	741	777	667	761	623	710
Median age	7.2	8.5	9.4	10.6	11.6	12.5	13.6	14.3
Percent	100	84.7	95	99.8	85.7	97.8	80	91

eighth grade number is 91 percent of this first grade enrolment. On the other hand, the one-teacher schools have only 49 percent as many pupils in the seventh grade as in the first, and in the eighth, only 43 percent as many. To put the matter differently, the larger schools show a larger percentage of retention in the eighth grade than do the smaller schools up to the end of the sixth grade. The holding

power of the larger schools is, apparently, very much greater. It would appear, therefore, that a large number of pupils dropped out of the one-teacher schools, 28 percent in fact, with only sixth grade schooling. For these pupils the median score in the reading test is only 42 points, which is the median achievement of fifth grade pupils

TABLE 8.—AGE-GRADE DISTRIBUTION OF ALL PUPILS TESTED IN ONE-TEACHER SCHOOLS IN CERTAIN SUPERVISORY DISTRICTS. ALSO MEDIAN AGES PER GRADE AND PERCENT EACH GRADE ENROLMENT IS OF ENROLMENT IN GRADE 1

Age	I	II	III	IV	V	VI	VII	VIII
4	1	..	..	..	..	..	..	..
5	58	2	..	..	..	..	..	..
6	215	39	3	..	..	..	..	..
7	**185**	150	24	3	..	..	..	..
8	150	**199**	140	43	2	1	..	..
9	43	128	**162**	134	33	4	..	..
10	17	57	120	**153**	85	31	4	2
11	5	13	42	105	**123**	110	27	10
12	1	9	19	56	118	**159**	83	27
13	2	2	16	26	53	89	**106**	74
14	2	1	5	18	37	61	68	**97**
15	..	..	1	3	15	30	43	58
16	1	..	..	2	2	2	2	20
17	..	..	..	..	1	..	1	5
18	..	..	..	..	1	..	1	..
19	..	..	..	..	..	..	..	..
Total	680	600	532	543	470	487	335	293
Median age	7.4	8.5	9.6	10.6	11.9	12.6	13.5	14.3
Percent	100	88.2	78.2	79.8	69.1	71.6	49	43

in the larger schools. It is within the facts to say that pupils who leave school with no better achievements than this will add greatly to the problem of near-illiteracy which the state confronts.

Two limitations upon the severity of these interpretations should be observed. In the first place, these age-grade tables are based upon the pupils who took the tests and these pupils are the ones who

happened to be in school on the day when the tests were given. Total figures for the year might have given somewhat different results. There is no obvious reason, however, why one class of schools would have been affected differently from another in this respect.

TABLE 9.—AGES: MEDIAN AGES FOR 3940 PUPILS IN ONE-TEACHER RURAL SCHOOLS AND 5717 PUPILS IN FOUR- AND MORE-TEACHER SCHOOLS. ONLY PUPILS EXAMINED BY TESTS ARE INCLUDED. SEVEN YEARS INTERPRETED AS SEVEN YEARS, NO MONTHS TO SEVEN YEARS, ELEVEN MONTHS

	I	II	III	IV	V	VI	VII	VIII
One room	7.4	8.5	9.6	10.6	11.9	12.6	13.5	14.3
Four room.....	7.2	8.5	9.4	10.6	11.6	12.5	13.6	14.3

The second point which must be considered is more important. It is a fact that some of the upper grades in larger schools were increased in size by the transfer of pupils from the smaller schools. Such transfer, while increasing the size of these eighth grades in the larger schools, would, at the same time, act unfavorably on the smaller schools by decreasing their numbers.

HOW WELL SHOULD CHILDREN READ?

The desirable standard of reading achievement for any level of school advancement is determined in part by the difficulty of the printed material to be found in school text books for that grade of advancement. As pupils pass into the upper grades, books are used more and more for the purpose of gaining information, and in the upper grammar grades the acquisition of certain specified forms of information becomes an end in itself. It all too often happens that in the upper grades teachers become so interested in the matter of information itself that little attention is given to increasing the pupil's ability to use the tools by which such information may be acquired. Reading as an end in itself becomes generally a matter of secondary consideration in grades seven and eight where stress is laid upon history, geography, mathematics, literature and science. It also often happens that the power to read books lags consider-

ably behind the acquisition of information itself, so that children are more or less bewildered by the text books which are put into their hands and which they are expected to use. Inability to read printed books often results in slow progress and failure for large numbers of children in these upper grades. Some of this slow progress and failure might be avoided if definite attention were given to increasing the pupil's skill in the reading of straightforward English prose. Some conception of the general reading difficulties which children encounter in the upper grades may be gleaned from quotations taken from text books designed for these grades.

"When the sun's rays are vertical at any point on a meridian, it is noon at all places on that meridian that are then lighted by the sun. Since the earth turns from west to east, the sun appears to move from east to west. Therefore, when it is noon at any place it is before noon or earlier at all places west, because the sun has not yet reached the meridians of those places. It is after noon, or later, at all places east, because the sun has already crossed the meridians of those places."

"A New York banker shipped $48,665 in gold to London to settle an account amounting to £10,000. He paid ⅛% freight and ⅛% for insurance. There was a loss of 1/16% by abrasion on $20,000 in $20 gold pieces, of ⅛% on $20,000 in $10 gold pieces, and of ¼% on the $5 gold pieces, which constituted the remainder of the shipment. What was the total cost to the banker, including the sum paid to replace the loss by abrasion?"

"The question of the re-election of Douglas to the Senate now came before the people of Illinois. Abraham Lincoln stepped forward to contest the election with him. 'A house divided against itself cannot stand,' said Lincoln. 'This government cannot endure half slave and half free. * * * It will become all one thing or all the other.' He challenged Douglas to debate the issues with him before the people, and Douglas accepted the challenge. Seven joint debates were held in the presence of immense crowds. Lincoln forced Douglas to defend the doctrine of 'popular sovereignty.' This Douglas did by declaring that the legislatures of the territories could make laws hostile to slavery. This idea, of course, was opposed to the Dred Scott decision. Douglas won the election and

was returned to the Senate. But Lincoln had made a national reputation."

"The glacier also had an important influence upon our manufacturing. Its load of rock fragments often filled parts of valleys so that after the ice was gone, the streams were compelled to seek new courses. These courses often lay down slopes or across buried ledges, over which the water tumbled in a succession of rapids and falls. Even the great cataract of Niagara was caused in this way and the same is true of many of the falls and rapids of hilly New England and New York. The many lakes act as storehouses to keep the noisy falls and rapids well supplied with water. For these reasons New England and New York have such abundant water power that they early grew to be the greatest manufacturing centers of the Union. In sections of the country not reached by the glacier, rapids and falls are much less common. Did the glacier cover the land on which you live?"

"In humid regions, whirlwinds do not usually appear to extend up to any considerable height; but in desert regions they may reach heights of 1,000 feet or more, as shown by the columns of dust. The rise is sometimes so great that the air is expanded and cooled enough to cause condensation of even the small amount of moisture contained in the desert air. Smart showers may then occur. Showers of this sort are likely to be of short duration, but the rainfall may be very heavy. If exceptionally heavy, such rains are known as cloudbursts. In such a storm, in the summer of 1898, rain enough fell in a few minutes, in the vicinity of Bagdad, in the Mojave Desert of California, to occasion serious washouts along the railroad for miles. A cloudburst at Clifton, S. C., June 6, 1903, caused the loss of more than 50 lives, and property damage to the estimated extent of $3,500,000. In desert regions, the water which starts to fall from the rising and expanding air is sometimes evaporated before it reaches the ground. Such 'suspended' showers may be seen often in Arizona in August."

To be sure it may be argued that text books containing such selections as these here quoted are too difficult for children in these upper grades. In general, however, they are not more difficult than the books and magazines which children will need to read out of school.

When students enter high school they are confronted by books containing, for the most part, ideas to which they are unaccus-

TABLE 10.—READING: SIGMA 3, FORM B. FOUR- OR MORE-TEACHER HIGH SCHOOLS. GRADES 9–12. DISTRIBUTION OF SCORES BY GRADES. MEDIAN SCORE AND MEDIAN AGE FOR EACH GRADE

Score	Grades			
	9	10	11	12
36–40	3	..	..	..
41–45	1	..	..	..
46–50	3	1	1	..
51–55	9	1	..	1
56–60	10	2	..	..
61–65	11	2	3	..
66–70	18	5	..	..
71–75	33	12	3	..
76–80	35	11	6	1
81–85	30	21	5	3
86–90	43	17	7	3
91–95	**57**	28	10	8
96–100	57	21	14	9
101–105	37	**31**	18	6
106–110	37	26	22	20
111–115	33	29	**20**	19
116–120	30	29	31	**20**
121–125	16	15	16	19
126–130	7	9	14	20
131–135	2	7	10	17
136–140	3	3	2	9
141–145	..	..	..	1
146–150	..	..	..	1
Total	475	270	182	157
Median score	95	103	112	118
Median age	15.1	16.3	17.2	17.8

tomed, written in a language generally more difficult than that of their grade text books. The difficulty of the new subject is increased

by whatever strangeness and difficulty attaches to the vocabulary in which these texts are written. Contrary to general assumption, the average eighth grade graduate is not sufficiently conversant with the

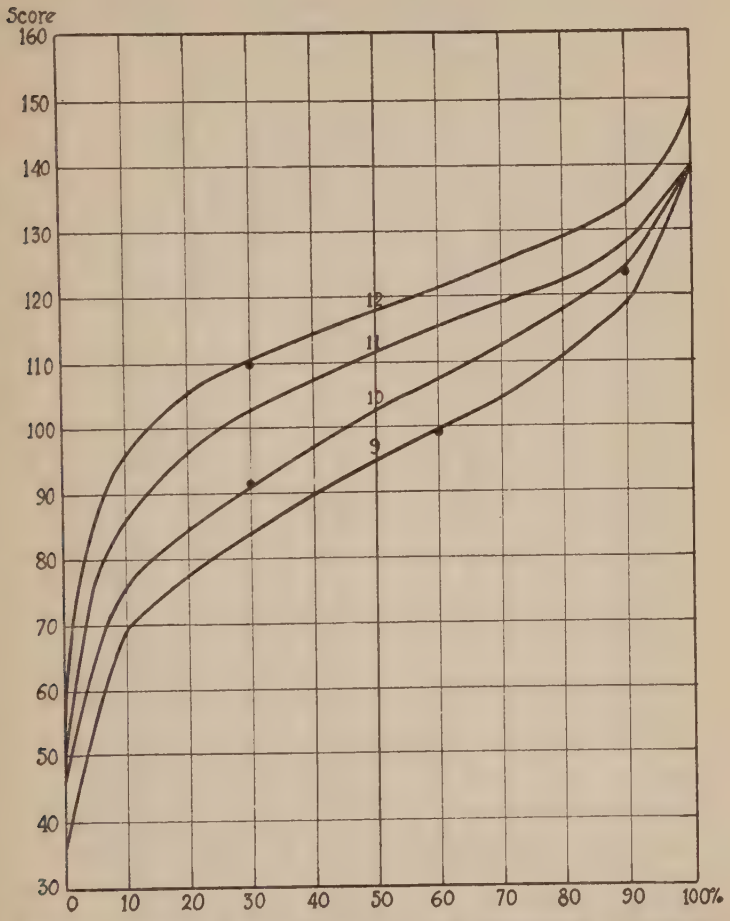

Figure 8.—Reading: Sigma 3, Form B. Large high schools. Grades 9–12. Percentile graph of scores by grades

elements of the English language to make the reading of high school texts either easy or pleasurable. Instead, he confronts the task of

"learning to read" and the teacher of high school science, of high school mathematics, or of literature becomes inevitably a teacher of

TABLE 11.—READING: SIGMA 3, FORM B. FEWER THAN FOUR-TEACHER HIGH SCHOOLS. GRADES 9–12. DISTRIBUTION OF SCORES BY GRADES. MEDIAN SCORE AND MEDIAN AGE FOR EACH GRADE

Score	Grades			
	9	10	11	12
31–35	..	..	2	..
36–40	..	..	1	..
41–45	2	..	1	..
46–50	3	..	1	..
51–55	6	..	1	..
56–60	6	2	..	..
61–65	..	2	1	..
66–70	17	..	1	..
71–75	15	1	..	..
76–80	16	1	3	..
81–85	16	6	3	1
86–90	18	7	5	2
91–95	17	7	6	3
96–100	12	10	3	1
101–105	15	10	5	6
106–110	16	7	9	7
111–115	7	11	7	10
116–120	6	8	6	4
121–125	4	7	5	1
126–130	3	5	5	3
131–135	1	1	3	4
136–140	..	1	2	1
141–145	..	..	..	..
146–150	..	..	..	..
Total	180	86	70	43
Median score	90	105	107	112
Median age	15.4	15.9	17.1	17.9

reading. How true this statement is may be evident on examination of the results of the Sigma 3 reading test in New York high schools.

Half of all high school pupils did not know accurately the meaning of "patriarch," "dexterity," "intrigue," "implacable" or "animosity." One-fourth failed to mark correctly the proper definitions of "conflagration," "obstacles," "harbinger," "sublime," "nocturnal" or "spherical." An equal proportion asserted that "grim

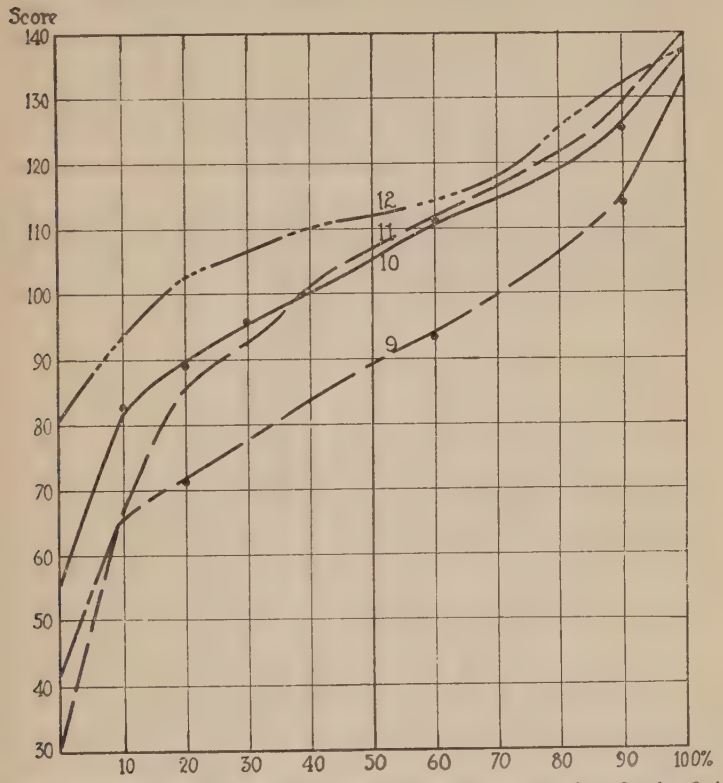

Figure 9.—Reading: Sigma 3, Form B. Small high schools. Grades 9–12. Percentile graph of scores by grades

determination invariably brings about reconciliation" and that "despots invest subordinates with great authority"; while one in every ten believed that "petty larceny is conducive to good repute"; that "citron is found in craters," and that "good citizens are insensible to progress."

Those students who remain on to the 12th grade, and graduate, do acquire facility in reading. The median score for this group is 118 points (see Table 10), with but few students making decidedly low scores. In general, this means that a high school senior will know 42 of the fifty words, understand 33 of the forty sentences and will answer correctly 22 of the 28 questions on the paragraphs.

Persons who can achieve these scores under the time limitations of the test have a good reading command of printed English as the average person meets it in papers, magazines, and books. Only about one-fourth of the pupils who enter the high school remain to the end of the senior year. As freshmen they have an achievement

TABLE 12.—READING: SIGMA 3, FORM B. SMALL AND LARGE HIGH SCHOOLS. SMALL HIGH SCHOOLS INCLUDE THOSE HAVING FEWER THAN 4 TEACHERS; LARGE, THOSE HAVING 4 OR MORE TEACHERS. MEDIAN SCORES AND MEDIAN AGES IN GRADES 9–12

Schools		Grades			
		9	10	11	12
Small High Schools	Score	90	104.5	107.1	111.7
	Age	15.4	15.9	17.1	17.9
Large High Schools	Score	94.6	103	111.5	118
	Age	15.1	16.3	17.2	17.8
Form A	..	84	90	96	102

of 95, which interpreted means that they know thirty-two of the fifty words, 26 of the forty sentences and 18 of the paragraph questions.

These figures are for the larger high schools. The results for the smaller high schools are in general inferior, as the figures of Table 11 show.

Too much stress should not be put upon comparative scores. It would be easy to find schools where the reading achievement of high school pupils is less than that of the New York schools, and among the schools examined there are some with enviable high records.

There can be little doubt, however, that the reading abilities of high school pupils in New York, as elsewhere, are much below the margin of adequacy required by the exigencies of practical life.

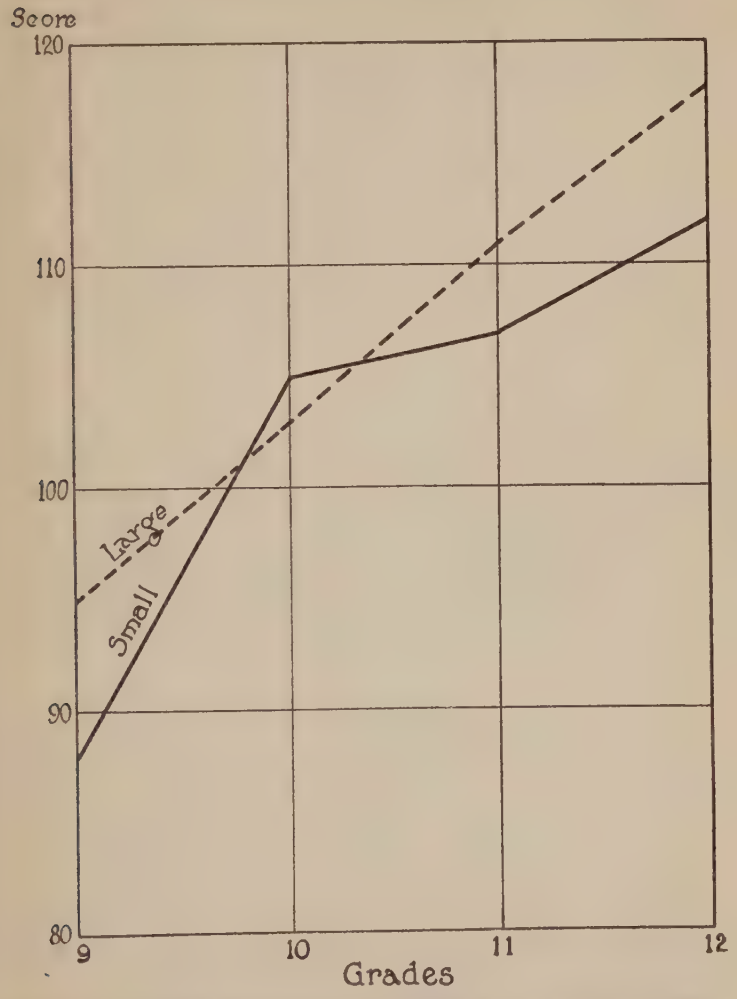

Figure 10.—Reading: Sigma 3, Form B. Fewer than four-teacher and four or more teacher schools. Grades 9–12. Median scores by grades

The teaching of reading is almost the whole instructional problem of the first grade of the elementary school; it occupies a major portion of the time both of teachers and of pupils in the second and third grades, and it bulks large in the curriculum of even the fourth and fifth grades. It is true, therefore, that a school which succeeds in teaching its primary pupils to read has a major claim to be counted efficient. It is also true that no achievement in other lines, however important, can compensate for failure in this work. If it were possible, therefore, to give an accurate measure of the ability of pupils to read at the end of the first, second, or third grades, we should have at once a crucial test of the educational efficiency of a school. Such a complete test of reading ability is too complex for the time allowed in the course of a school survey. Certain phases of reading ability may be tested, and in the absence of other evidence of successful teaching in these grades the results may be used as the measure of the work of these grades.

For the measurement of reading achievement in the first four grades in the elementary school in the New York Survey, a reading examination requiring in all about thirty minutes of the pupil's time was used. This examination was devised by the writer and Dr. Margaret Noonan for the Virginia Survey. It is described in Part 2 of the Survey Report,[1] and in a Manual of Directions[2] subsequently issued by the World Book Company. The examination, designated Sigma 1, is composed of two tests:

> "Test 1 is a sentence and paragraph reading test. Accompanying the sentences and paragraphs are pictures. In each case there is a direction for the pupils to make some mark upon the picture. This is the only response of the pupil. Whether or not the pupil is able to read the sentence is measured by the kind of marks which he makes on the picture. He is not required to do any writing. The items of the test—twenty-five in number—are arranged in order of difficulty, the easiest one being placed first and the succeeding ones being more difficult. In the construction of the test, careful attention was given to selecting only those

[1] Virginia Public Schools, Part 2, pp. 45, ff.

[2] Haggerty Reading Examination, Manual of Directions for Sigma 1 and Sigma 3, World Book Company, 1921.

words which were found in the primers and first-grade readers. Presumably an intelligent child who had had proper instruction in primary reading should be able to make a score on the easier parts of the test. As he proceeds through the tests, however, the items become more difficult, and towards the end only third-grade children will be able to read and respond properly to the directions. The test is given principally as a 'power' test, not as a speed test—twenty minutes in time being allowed, which is more than most first and second or even third-grade children will be able to use."

The first line of Test 1 which was

---

1. Put a tail on this pig.

The successive lines increased in difficulty up to paragraphs like the following:

(*Read this paragraph and then do what it says to do. Read it again if you need to.*)

"But we are anxious to see the inside of this wonderful craft; so, after a few minutes in the turret, we go down the narrow hatchway into the boat itself. Here we are immediately struck by the amount of machinery everywhere and the neatness and compactness of everything. Behind the living room is the engine room. Here are two heavy oil engines for driving the boat on the surface, and a powerful motor for use when the boat is submerged. In another compartment there are storage batteries for supplying the electric current for the motors, lights, and cooking apparatus."

24. Draw a line under the one of these three words that shows what is described in this paragraph. sailboat aeroplane submarine

25. Draw a line under the one of these three words that best shows the amount of machinery to be seen. little much none

"This test is preceded by a fore-exercise which is given as a lesson in which the pupils are instructed exactly how to perform the various things called for later in the test. Adequate attention is given to this fore-exercise, so that presumably every child of

normal intelligence should be able to follow the directions in the test proper. This test with its fore-exercise occupies seven pages of an eight-page booklet.

"Page eight of this booklet contains test 2, which also is a sentence reading test modeled after the so-called 'Devens Literacy' test. This test consists of twenty interrogative sentences arranged in order of difficulty. It is preceded by a fore-exercise which, as in the case of test 1, is taught to the pupils before the test proper is given. The only response called for on the part of the child is to make a line under one of two words, 'Yes' or 'No,' whichever may be the correct answer to the question asked. The time allowed for this test is two minutes."

The Sigma 1 test has been widely used throughout the country for the measurement of reading achievement in the lower grades, both in large city schools and in smaller places, and in one-room rural schools. In the survey of the North Carolina schools about two thousand children were tested. For comparative purposes, therefore, there are available, not only the "norms," which were based on results in good city schools in the northern states, but other median scores from schools of various types in a number of states throughout the country.

Primary Reading Results

The results of the Sigma 1 test in grades 1 to 4 are given in tables 14 to 15 for the larger and smaller schools separately. The median scores for the two types of schools are given in Table 13, where are also given the scores for North Carolina, Virginia, and Wisconsin. Both urban and rural schools are represented in these comparative scores. A graphic picture of these scores is given in Figure 11.

In comparison with North Carolina and Virginia schools the New York scores are slightly lower. Virginia rural pupils in grade 1, with a median age of 7.5 years score 3.5 points, whereas New York first grades, slightly younger, score less than 3 points. Too much weight cannot be attached to these scores since from their smallness it is evident that the test is too difficult for the first grade. The percentage of zero scores is excessive. The same restriction cannot apply, however, to grade 2, where the percentage of zero scores is less than 6, and where the median score is sufficiently large for valid

measurement. For this grade the New York scores, even for the larger schools, is distinctly below that for any group represented in Table 13. The rural Virginia schools and the rural North Carolina

TABLE 13.—READING EXAMINATION, SIGMA 1, ONE- AND FOUR-TEACHER SCHOOLS IN ALL COUNTIES. FOUR-TEACHER SCHOOLS INCLUDE ALL LARGER SCHOOLS. MEDIAN SCORES AND MEDIAN AGES FOR GRADES 1–4. MEDIAN SCORES FOR OTHER SCHOOLS

Schools		Grades							
		1		2		3		4	
		Score	Age	Score	Age	Score	Age	Score	Age
New York	One-teacher	2	..	9.5	..	22.6	..	29.2	..
		..	7.3	..	8.5	..	9.6	..	10.6
	Four-teacher	2.4	..	12.7	..	26.7	..	34.3	..
		..	7.1	..	8.4	..	9.4	..	10.6
Virginia	Richmond	4.1	..	17.9	..	29.1	..	..	..
		..	7.6	..	8.8	..	9.7	..	..
	Norfolk	6	..	18	..	29	..	..	..
		..	7.1	..	8.3	..	9.1	..	..
	Rural	3.5	..	14.5	..	26.7	..	..	..
		..	7.5	..	8.6	..	9.8	..	..
Wisconsin	Kindergarten group	11.7	..	23.4	..	33.4	..	..	..
	Non-kindergarten group	9.6	..	20	..	35.7	..	..	..
North Carolina	Raleigh	2.8	..	17.8	..	32.7	..	..	..
	Four-teacher schools in 4 counties	..	..	14	..	26.1	..	27	..
Kansas City	..	..	..	18	..	30	..	..	..
	..	..	..	..	8.9	..	9.6	..	..
Beaumont	..	..	..	..	..	30	9.6	..	..
Cleveland	Bright pupils	14.5	7.0	..	..	..	..	..	..
	Medium pupils	8.3	7.2	..	..	..	..	..	..
	Slow pupils	4.0	7.1	..	..	..	..	..	..
Norms	..	6	..	20	..	30	..	38	..

schools score 14.5 and 14 points respectively, while the New York score is 12.7 points. As compared with Richmond, Norfolk, Raleigh, or either of the two Wisconsin groups, the deficiency is still greater, and greatest when compared with the standard norm. The latter

is derived from examinations given to pupils in St. Louis, Madison, Bloomington, Minneapolis, and Santa Anna. In terms of this standard norm the New York schools in grades 2, 3, and 4, are about

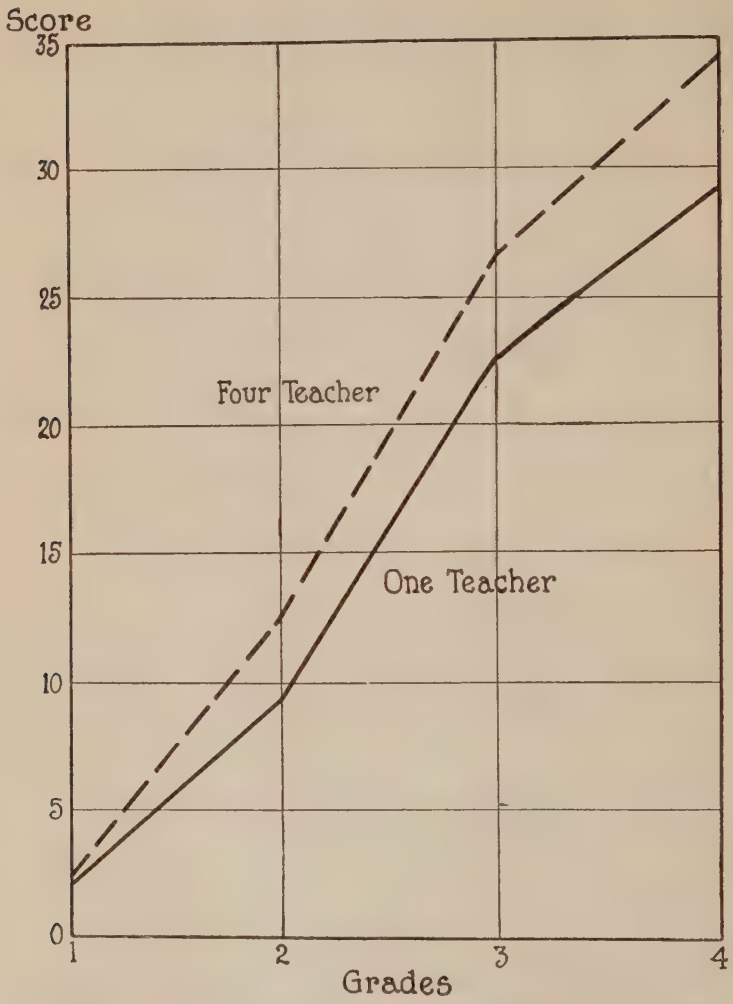

Figure 11.—Reading examination, Sigma 1. One- and four-teacher schools in all counties. Grades 1–4. Median scores by grades

one-half year behind where they should be. The matter may be put in another way. About 23 percent of the New York pupils in grade 2 reach this standard. For grades 3 and 4, respectively, the figures are 27 and 23 percent respectively. In other words, about 77 percent of the 5000 pupils represented in Tables 14–15 read less well than their grade advancement would indicate is desirable.

TABLE 14.—READING: SIGMA 1. FOUR-TEACHER SCHOOLS. GRADES 1–4. DISTRIBUTION OF SCORES BY GRADES. MEDIAN SCORE AND AGE FOR EACH GRADE

Score	Grades				
	1	2	3	4	
0	209	28	4	..	241
1–5	**330**	170	20	3	523
6–10	89	109	46	9	253
11–15	47	**109**	75	20	251
16–20	26	100	110	37	**273**
21–25	8	86	133	74	301
26–30	8	47	**180**	109	344
31–35	3	23	108	**170**	304
36–40	..	10	82	191	283
41–45	..	..	33	112	145
46–50	..	..	..	..	..
51–55	..	..	..	..	..
Totals	720	682	791	725	2918
Median score	2	13	26	34	19.5
Median age	7.1	8.4	9.4	10.6	..

There are individual New York schools which equal and even exceed the standard norm. Cherry Valley, for instance, has a median achievement for grade 2 of 24.5 points, Rye number 1 has 26, Rye number 2, 21, and Rose 28.5 points. But in another school eighteen of the 22 pupils score between zero and 5, in still another school 25 of the 43 pupils have this low performance, and in one

county the entire group of second graders in one-teacher schools—more than 100 pupils—have a median score of only 9.1 points.

Inasmuch as the first grade pupils score less than 3 points it may be pertinent to show just what this means in the concrete.

There are just twelve words aside from "a" and "the" which the child must know in order to read the three sentences required for a

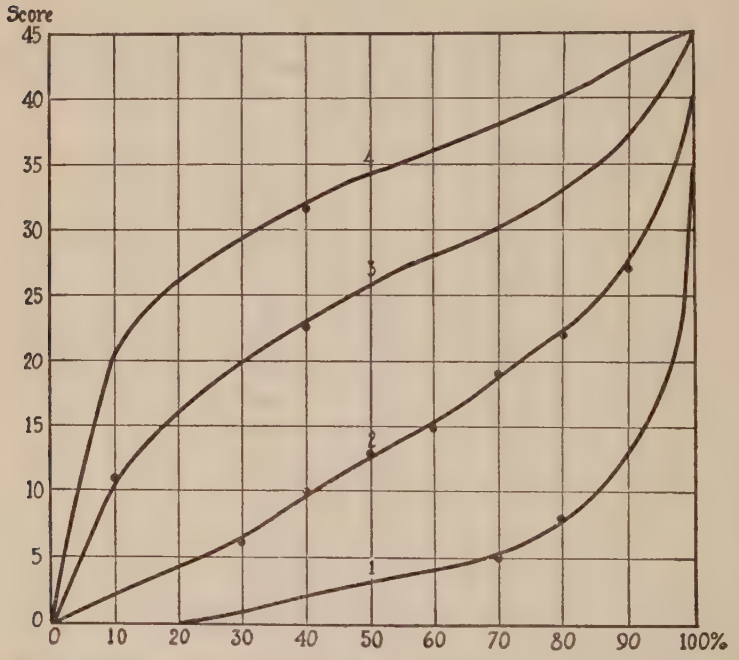

Figure 12.—Reading examination, Sigma 1. Four-teacher schools. Grades 1–4. Percentile graph

score of 3. Five of these words are actually taught him during the fore-exercises on page 1 of the test. He must be able to recognize just seven additional words as follows: "tail," "this," "pig," "around," "squirrel," "wing," "goose." All these words are in the Jones list of words common to ten primers and all of them are found in the first readers used in the New York schools. To acquire a knowledge of these words, to understand them when they are seen

in sentences, and to follow the directions which they give, seems a small achievement for one year of schooling. Yet more than fifty

TABLE 15.—READING: SIGMA 1. ONE-TEACHER SCHOOLS. GRADES 1–4. DISTRIBUTION OF SCORES BY GRADES. MEDIAN SCORE AND AGE FOR EACH GRADE

Score	Grades				Totals
	1	2	3	4	
0	218	35	2	..	255
1–5	**368**	168	22	5	563
6–10	65	**135**	40	9	249
11–15	27	88	71	21	**207**
16–20	5	75	87	65	232
21–25	1	63	**112**	94	270
26–30	..	27	94	**127**	248
31–35	..	11	51	115	177
36–40	..	1	28	91	120
41–45	..	..	7	24	31
46–50	..	..	..	..	..
51–55	..	..	..	..	..
Totals	684	603	514	551	2352
Median score	2	10	23	29.2	14
Median age	7.3	8.5	9.6	10.6	..

TABLE 16.—READING: SIGMA 1. ONE-TEACHER AND FOUR OR MORE TEACHER SCHOOLS. PERCENT OF PUPILS MAKING STANDARD NORM IN GRADES 1, 2, 3, AND 4

School	Grades				Average
	1	2	3	4	
One-teacher	14	19	19	13	14
Four-teacher	25	27	33	31	29
All	20	23	27	23	23

percent of the New York first-grade children tested could not equal a score of 3.

Even this is not quite a fair statement of the case. A child was not confined to the first three sentences in order to score 3. He might fail on sentence 3, if he could read sentence 4 with the words "find," "rabbit's," "make," "it," "longer," or if he could read sentence 5 with the words "each," "bird," "that," "is," and "ground."

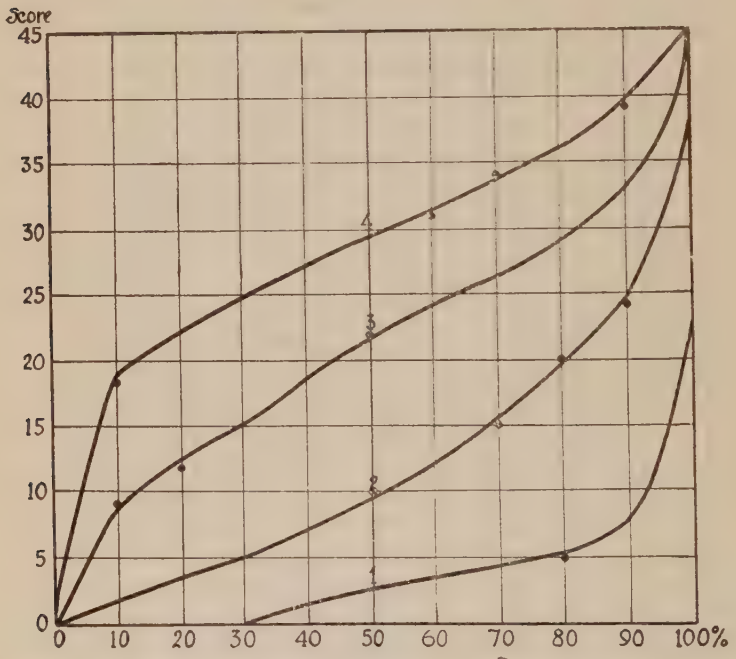

Figure 13.—Reading examination, Sigma 1. One-teacher schools. Grades 1–4. Percentile graph

It is admitted that the ability to recognize the words in question is not the only thing involved. There are the equally important factors of the relations of words and of the ability to follow directions, the latter certainly being a matter of intelligence. Conceding all these matters, however, it is still probable that where reading has been well taught, there the pupil will make the highest scores in this test.

Reading Achievement by Ages

A school grade is a more or less artificial classification of pupils for purposes of instruction. Being artificial, it is subject to wide

Table 17.—Reading: Sigma 3, Form B. Four-Teacher Elementary Schools and All High Schools. Grades 5–12. Distribution of Scores by Ages. Median Score for Each Age

	Ages										Totals
	10	11	12	13	14	15	16	17	18	19	
0	1	1	2	..	..	..	..	..	..	..	4
1–5	..	2	2	6	2	1	..	..	..	..	13
6–10	2	4	6	4	1	1	..	..	..	..	18
11–15	..	9	13	9	7	1	1	..	..	..	40
16–20	4	13	10	11	10	7	2	1	..	..	58
21–25	8	10	16	16	8	7	2	..	..	..	67
26–30	20	23	17	24	17	11	1	..	..	..	113
31–35	17	20	34	27	21	11	3	1	..	1	135
36–40	11	42	38	33	25	12	5	1	..	..	167
41–45	19	37	44	32	35	15	15	3	1	..	201
46–50	**28**	25	46	33	26	32	8	2	..	..	200
51–55	21	28	37	34	34	27	10	2	2	..	195
56–60	15	**36**	25	34	38	25	11	6	3	..	193
61–65	14	27	**42**	42	33	23	11	6	1	..	199
66–70	13	27	34	46	54	38	19	8	4	1	244
71–75	11	36	31	**53**	48	42	28	5	4	..	258
76–80	12	27	29	53	**60**	36	13	13	4	2	249
81–85	5	15	40	39	53	**42**	32	10	8	..	244
86–90	3	15	28	42	46	48	32	15	8	4	241
91–95	6	8	41	35	56	36	**35**	15	7	6	245
96–100	3	10	23	39	60	28	24	15	15	4	221
101–105	..	3	21	21	35	35	30	17	**12**	6	180
106–110	2	1	11	20	34	32	29	**32**	12	..	173
111–115	..	3	11	27	31	27	24	31	10	**7**	171
116–120	1	1	7	19	25	25	31	27	15	4	155
121–125	..	..	1	6	17	17	18	25	9	4	97
126–130	..	..	2	3	6	11	15	17	7	5	66
131–135	..	1	..	1	6	5	13	20	5	2	53
136–140	..	..	..	1	3	1	4	16	2	2	29
141–145	..	..	..	..	2	..	..	7	1	..	10
146–150	..	..	..	..	..	..	..	1	..	..	1
Totals	216	424	611	710	793	596	416	296	130	48	4,240
Median score	50	56	63	71	79	82	93	110	105	111	..

variations from school to school. Thus, the median age of fifth grade pupils examined in the one-teacher schools of Tompkins

TABLE 18.—READING: SIGMA 3. ONE-TEACHER SCHOOLS. GRADES 5–8. DISTRIBUTION OF SCORES BY AGES. MEDIAN SCORE FOR EACH AGE

	Ages									Totals
	10	11	12	13	14	15	16	17	18	
0	..	..	..	..	1	1	..	..	..	2
1–5	2	4	4	..	4	1	..	..	..	15
6–10	4	8	3	4	5	3	..	..	1	28
11–15	6	12	13	7	6	7	..	1	..	52
16–20	9	15	20	13	9	9	..	..	..	75
21–25	17	13	23	23	17	2	..	..	..	95
26–30	11	25	36	13	12	5	2	..	..	104
31–35	13	27	41	21	12	13	2	1	..	130
36–40	**14**	27	49	25	17	5	3	..	1	141
41–45	18	**21**	**33**	35	22	16	6	2	..	153
46–50	8	17	30	21	21	14	2	2	2	117
51–55	9	22	29	26	23	18	4	..	..	131
56–60	7	16	23	24	24	18	4	**4**	..	120
61–65	6	17	19	**29**	31	**17**	6	..	..	125
66–70	2	8	14	33	**31**	16	**7**	2	1	114
71–75	3	5	11	36	17	15	8	2	1	98
76–80	3	3	11	23	34	17	1	..	1	93
81–85	2	3	9	26	33	17	3	1	1	95
86–90	2	4	13	23	27	9	5	..	..	83
91–95	1	2	13	29	31	11	6	1	..	94
96–100	..	4	6	10	24	4	1	..	..	49
101–105	..	3	15	15	20	2	1	..	..	56
106–110	..	4	5	9	12	5	..	..	..	35
111–115	..	1	3	6	6	2	..	1	..	19
116–120	..	2	3	3	10	2	..	..	..	20
121–125	..	..	1	..	2	..	..	..	..	3
126–130	..	..	2	..	..	..	..	..	..	2
131–135	..	..	..	..	1	..	..	..	..	1
136–140	..	..	..	..	..	..	..	..	..	..
Totals	137	263	429	454	452	229	61	17	8	2,050
Median score	37.6	41	45	64	68	62	67	59	..	..

county is 12.6 years; in similar schools of Oswego county the median age is 11.5 years. In one four-teacher school in Erie county the

median age is 10.9 years; in a school of similar type in Westchester county the median age is 13 years. These variations occur despite the fact that when the ages for all one-teacher schools and all four-teacher schools are combined there is a difference between median ages of only .3 of a year.

The median ages of pupils in the several grades of a school might, in fact, be taken as a measure of the effectiveness of that school, and the median ages of corresponding grades would be a relative measure that would indicate relative efficiency of several schools or school systems. Such a measure should be carefully correlated with

TABLE 19.—READING: SIGMA 3, FORM B. ONE-, TWO-, AND THREE-TEACHER ELEMENTARY SCHOOLS. GRADES 5–8. FOUR-TEACHER ELEMENTARY SCHOOLS AND ALL HIGH SCHOOLS. GRADES 5–12. MEDIAN SCORES BY AGES

School	Ages									
	10	11	12	13	14	15	16	17	18	19
One-room elementary schools. Grades 5–8	38	42	45	67	68	62	67	59	66	..
Two-room elementary schools. Grades 5–8	29	37	54	45	46	61	..	..	..	..
Three-room elementary schools. Grades 5–8	48	41	48	54	57	51	46	..	..	..
Four-room elementary schools and all high schools	56	56	63	71	79	82	93	110	105	111

the school achievements of such schools. In presenting the results of the reading tests, therefore, the median ages have in each case been given.

The combinations of the several schools tend to obscure certain facts. It is, therefore, deemed advisable to present the reading test scores in terms of children's ages regardless of the grades in which the pupils of a particular age are found. In Table 19 the facts are given for the upper grade reading test. About 6000 pupils are represented in this table: 2000 in one-teacher schools and 4000 in the larger schools. In the "larger schools" are included the pupils of the several ages who are in high school in the districts included.

There were no high school pupils in the one-teacher schools. Graphic representation of the facts may be found in Figure 14. The

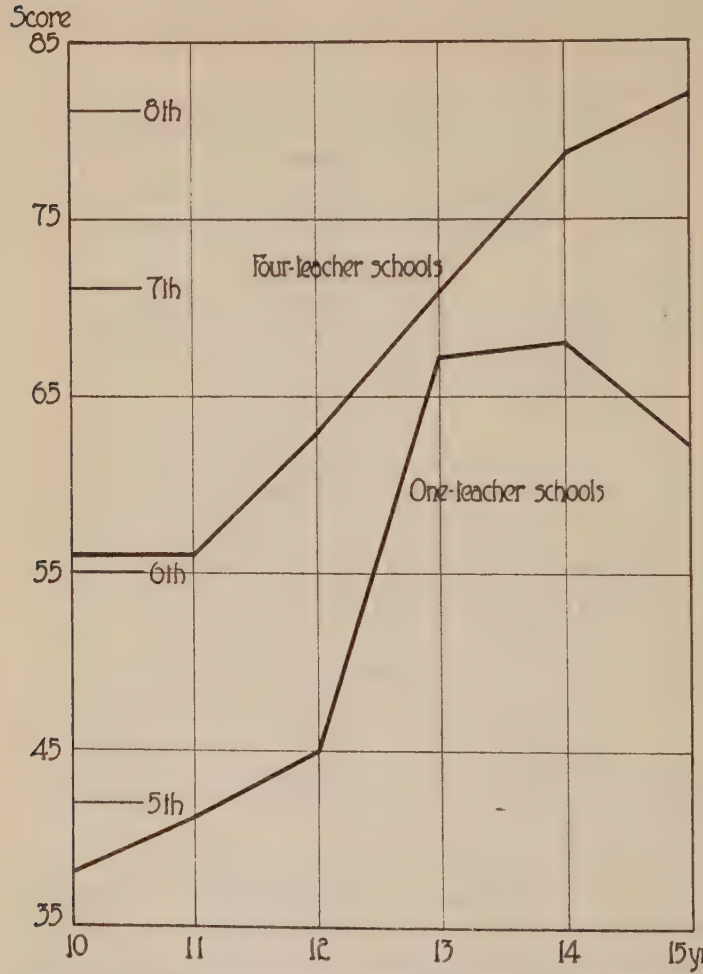

Figure 14.—Reading examination, Sigma 3, Form B. One-teacher schools. Grades 5–8. Four-teacher schools. Grades 5–8 and all high schools

pupils in the smaller schools uniformly score below the pupils of corresponding ages in the larger schools. In the case of the 10-year-

olds (there were no high school students in this group) the difference is 18 points which is about equal to the progress which average pupils will make in one year of schooling. For the other ages similar discrepancies appear as between the smaller and the larger schools. The one exception to this is for age 13, where the pupils of the smaller schools make a higher score than would be expected from the performance of the 12- or 14-year-olds. The real cause of

TABLE 20.—READING: SIGMA 1. FOUR-TEACHER SCHOOLS. GRADES 1–4. DISTRIBUTION OF SCORES BY AGES. MEDIAN SCORE FOR EACH AGE

	Ages											
	5	6	7	8	9	10	11	12	13	14	15	16
0	15	81	66	52	14	5	5	..	3	..	..	..
1–5	**26**	**121**	131	131	64	30	7	7	4	2	..	..
6–10	2	42	**52**	64	37	23	16	7	6	2	1	1
11–15	3	24	60	60	40	35	11	8	7	2	1	..
16–20	..	25	52	**55**	57	38	25	15	3	3	..	..
21–25	..	10	36	83	64	45	30	15	13	**3**	**2**	..
26–30	..	9	28	69	**94**	**47**	**35**	**19**	**9**	2	2	..
31–35	..	..	17	54	87	59	44	22	11	3	1	1
36–40	..	..	11	38	95	64	27	14	12	2	..	..
41–45	..	..	3	19	59	40	17	2	..	2	..	..
46–50	..	..	..	..	..	..	..	..	..	..	..	..
Totals	46	312	456	625	611	386	217	109	68	21	7	2
Median score	2	3	9	17	28	28	28	27	26	24	24	..

this is not apparent unless it be the greater elimination in the upper grades of the one-teacher schools.

The results by ages for the upper grade reading are confirmed by the reading scores for the first four grades, as is obvious from a study of Table 22. The ages shown are from 5 to include 11. There are a number of still older pupils in these grades but they are retarded pupils and so few in number that their scores do not properly represent age achievements. Inasmuch as there are large numbers

of eleven-year-olds in grades above the fourth—62 percent in one-room school and 66 percent in larger schools—the figures for these

TABLE 21.—READING: SIGMA 1. ONE-TEACHER SCHOOLS. GRADES 1–4. DISTRIBUTION OF SCORES BY AGES. MEDIAN SCORE FOR EACH AGE

	Ages											
	5	6	7	8	9	10	11	12	13	14	15	16
0	37	75	70	50	14	4	1	2	2	..	..	..
1–5	23	**135**	**140**	136	71	38	12	5	3	1	..	1
6–10	3	26	52	**74**	47	30	6	2	6	1	..	..
11–15	..	8	30	65	48	28	13	6	3	2	..	1
16–20	..	8	27	45	61	45	17	10	5	7	1	..
21–25	..	5	22	46	**80**	**53**	35	14	**6**	**4**	..	..
26–30	..	3	13	34	55	58	**32**	**23**	10	6	**2**	1
31–35	..	..	3	26	49	52	24	12	3	2	..	..
36–40	..	..	2	7	34	34	22	7	6	..	..	..
41–45	..	..	..	2	7	..	5	..	..	..	..	..
46–50	..	..	..	..	..	..	..	..	..	..	..	..
Totals	63	260	359	485	466	342	167	81	44	23	3	3
Median score	..	3	5	10	22	24	26	26	23	21	26	11

TABLE 22.—READING, SIGMA 1. MEDIAN SCORES OF PUPILS IN ONE- AND FOUR-TEACHER SCHOOLS BY AGES

School	Ages in years						
	5	6	7	8	9	10	11
One-teacher	0.0	3	5.1	10	22	24	26
Four-teacher	1.6	3	8.6	17.0	28	28	28
Standard age norms	..	6	10	19	27	33	43

ages are less significant. With these restrictions, it may be seen that the larger schools are securing better results in reading. For eight-year-olds, the largest of the age groups, the difference is 6

points, which is about two-thirds of a year superiority for the larger schools. About one-half year's difference occurs for the nine-year-olds. The ten-year-old scores are vitiated by the factor of selection, 30 percent of ten-year-olds being above grade 4. Figure 15 shows the scores graphically.

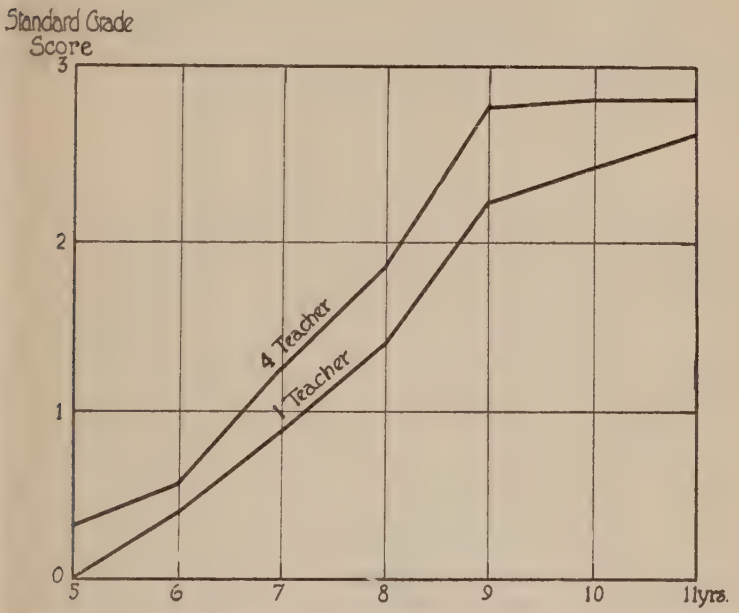

Figure 15.—Reading: Sigma 1. Median age scores for pupils in one- and four-teacher schools

Reading and Intelligence

How much of the inferior reading achievement of the rural schools and particularly of the one-teacher schools may be due to inferior native capacity on the part of the pupils in these schools and how much of it is due directly to inadequate educational provisions is a matter which will be discussed in Chapter VIII. Considerable data bearing upon the problem are available in the results of the so-called intelligence examinations which were given to all pupils from grades 3 to 12 inclusive. The determinations of the

relative proportion of success or failure chargeable to native capacity is an important item in the proper evaluation of the school product. On the one hand, the school should not be charged with deficiencies due to low native abilities in pupils. On the other hand, if it should appear that the pupils in the smaller schools have less capacity than the pupils in the larger schools, there exists an added reason for superior educational efficiency in these schools because the practical needs of the adult are not less, but in reality more. The whole matter will receive consideration later.

Recommendations

1. The reading situation in the New York rural schools clearly calls for remedial measures. The first of such measures is a clearer recognition on the part of school authorities of the importance of the subject and of the existing deficiencies. The naïveté with which the State Department syllabus for English Language and Literature outlines the "chief aims" in literature teaching—they are very noble aims, indeed—in utter indifference to the existing reading deficiencies of elementary and high school pupils indicates that the beginning of improvement is to be made by those who prescribe courses of study. One searches this syllabus in vain for any recognition of the fact that *high school students must be taught to read* or for any suggestion of the essential technique for improvement of the silent reading ability of pupils. Until those in authority recognize the facts and the importance of silent reading skill, little will be accomplished.

2. A second suggestion is that objective measures of reading ability which give attainable standard scores should be used so that both teachers and pupils may have a clear understanding not only of the present status of pupils but also of the desirable goals to be attained. If existing tests and examinations do not commend themselves, others may be made and used. These should provide standards for every grade from 1 to 12.

3. Third, there should be increased supervision of instruction in reading in the elementary school. By supervision here is meant something very different from inspection and criticism. It should

be the helpful sort that teaches teachers how to teach children to read.

4. Any suggestion made for the improvement of reading applies with greatest force to the one-teacher schools. It is in them that the pupils are in greatest need, and the teachers of these schools are least able to make, unaided, the desired improvement.

CHAPTER IV

MEASURES OF ABILITY

IN THE foregoing pages the results of the reading tests have been presented with little or no reference to the original capacities of pupils. It has been assumed, by inference, at least, that all pupils are equally endowed with the mental ability necessary to do school work. That such an assumption as regards individuals is invalid, there is abundant evidence in modern experimental education to show, for there is no more significant outstanding result of recent studies than that individuals differ measurably in their mental equipment, and that educational methods must take account of these differences in native endowment.

While these differences as regards individuals are a generally accepted tenet of current educational discussion, it is not equally clear that whole communities may be characterized as superior or mediocre or inferior. It may just be possible that individuals of varying capacities are so distributed throughout the population in this respect as to equalize all communities. Much of our school organization which extends over wide areas, as, for instance, a state, seems to make this assumption. Such differentiation of curriculum as does occur is generally made in reference to vocational interests and needs or community problems rather than in any adaptation to capacities of pupils. In how far this assumption is valid is a matter of scientific and, to some extent, of practical interest, and a state-wide survey gives an opportunity to study the problem to some degree.

If such native capacities, either of individuals or of communities, do exert a determinative influence on school product, their existence should be carefully considered in a discriminating assessment of school achievements. If a good school product is primarily the out-

come of good ability on the part of the pupils, this fact, if known, should prevent an undiscriminating praise of methods of instruction and school organization. Conversely, a teacher or school should not be charged with a poor school product when the latter is due chiefly to low ability on the part of pupils. The same methods of instruction and school procedure which give good results with pupils of ordinary ability may be inadequate with pupils of poor ability, and if the latter are to be brought up to a satisfactory achievement, it may call for different and better methods of teaching. It may be equally true that pupils of superior ability are inefficiently taught when grouped with their inferiors or when they are subjected to the same curriculum and the same methods of instruction.

It is easier to state the need for such discrimination than it is to devise an adequate method for making it. In any child of six who comes to school, original capacities and acquired habits are so blended as to be largely inextricable. The complexity increases with succeeding school years. What a child of any age within the limits of schooling does with reference to an arithmetical problem is due in part to his original capacities and in part to his school and life experience. To separate these factors in his performance and to determine the part of that performance which is directly attributable to his school life is exceedingly difficult and to a degree impossible. The discrimination is so important, however, for a correct evaluation of school influence that any approach to an accurate separation of the two factors seems important. Such an approach is to some extent possible through the technic developed in connection with educational measurements and particularly with intelligence testing.

Intelligence Examinations

To avail ourselves of the values of this technic, a series of so-called intelligence tests were given throughout the survey. The Haggerty Intelligence Examination, Delta 2,[1] was given to all pupils tested in grades 3 to 12 inclusive, and in addition, the Miller Mental Ability Test[2] was given to all high school pupils. The results of the

[1] Haggerty, M. E.: Intelligence Examination, Delta 2, 1920, World Book Co.
[2] Miller, W. S.: Mental Ability Test, Form A, 1921, World Book Co.

tests are therefore available for about 7550 children and for every type of rural school.

Before proceeding to a study of these results a brief examination of the tests will be in order.

Haggerty Intelligence Examination, Delta 2

The Haggerty Intelligence Examination, Delta 2, is a modification and adaptation of the Army Intelligence examinations. It comprises the arithmetical problems, synonym-antonym, practical judgment, and information tests of the army Alpha examinations, the picture-completion test of the Beta group, and the sentence reading tests, sometimes called the "Devens Literacy" test. The several tests chosen were modified by a selection of the items best adapted to school conditions and by the addition of similar items. The six tests thus adapted are printed in a single booklet. The directions for giving the test are simple; the time for the entire test is short, twenty-one minutes, net time, and the scoring is entirely objective. The relation which each of the tests holds to the total score may be seen from the table of coefficients of correlation[1] (Table 23). This table also gives the intercorrelations of the several tests.

This intelligence examination has had wide usage in survey and experimental problems, and numerous correlations and other evidences of its usefulness are now available.

This experimental evidence shows that it may be used with a high degree of assurance to predict the success of pupils.[2] The correlations with school progress, teachers' ratings for intelligence, school marks and other tests of similar type are all significant.

As illustrative of this fact an example may be taken from the results of the tests in the Virginia Survey. Figure 16 is here reproduced from Part 2 of the Virginia Public Schools. It may be explained by the description there printed.

"The numbers along the base line represent the criterion score. The heavy horizontal line across the middle of the figure indicates

[1] Unless otherwise stated, all coefficients of correlation given in this volume are by the Pearson Products Moment method.

[2] Virginia Public Schools, Part 2, Yonkers, New York, 1921.

TABLE 23.—INTELLIGENCE EXAMINATION, DELTA 2. COEFFICIENTS OF CORRELATION FOR EACH TEST WITH TOTAL SCORE AND INTERCORRELATION OF SEVERAL TESTS WITH EACH OTHER. 232 CASES OF TWELVE-YEAR-OLD PUPILS

	Total		Test 1		Test 2		Test 3		Test 4		Test 5		Test 6	
Total... r =		..	.89	..	.76	..	.65	..	.87	..	.88	..	.90	..
Total... P.E. =		..	..	±.0108	..	±.017	..	±.022	..	±.01	..	±.0108	..	±.007
Test 1.. r =	.89	..	..	..	.66	..	.54	..	.69	..	.72	..	.75	..
Test 1.. P.E. =	..	±.01	..	..	..	±.022	..	±.029	..	±.019	..	±.019	..	±.017
Test 2.. r =	.76	..	.66	..	..	..	.44	..	.55	..	.64	..	.72	..
Test 2.. P.E. =	..	±.017	..	±.022	..	..	..	±.032	..	±.024	..	±.024	..	±.019
Test 3.. r =	.65	..	.54	..	.44	..	..	..	.43	..	.56	..	.63	..
Test 3.. P.E. =	..	±.022	..	±.029	..	±.032	..	..	..	±.032	..	±.024	..	±.024
Test 4.. r =	.87	..	.69	..	.55	..	.43	..	..	..	.64	..	.69	..
Test 4.. P.E. =	..	±.01	..	±.019	..	±.024	..	±.032	..	..	..	±.022	..	±.019
Test 5.. r =	.88	..	.72	..	.64	..	.56	..	.64	..	..	..	.81	..
Test 5.. P.E. =	..	±.01	..	±.019	..	±.024	..	±.024	..	±.022	..	..	..	±.014
Test 6.. r =	.90	..	.75	..	.72	..	.63	..	.69	..	.81	..	..	..
Test 6.. P.E. =	..	±.007	..	±.017	..	±.019	..	±.024	..	±.019	..	±.014	..	..
Average r for each test with remaining five.....	.825		.672		.602		.52		.60		.674		.72	

the median score (76) in the intelligence examination, Delta 2. The horizontal line next above (+ 1Q) is placed at a distance from the median, which is equivalent to the semi-interquartile range (Q) of the scores in the Delta 2 examination. The second horizontal line (+ 2Q) above the median is placed at twice the distance of the semi-interquartile range above the median. Similarly, −3Q represents three times this measure of variation. In

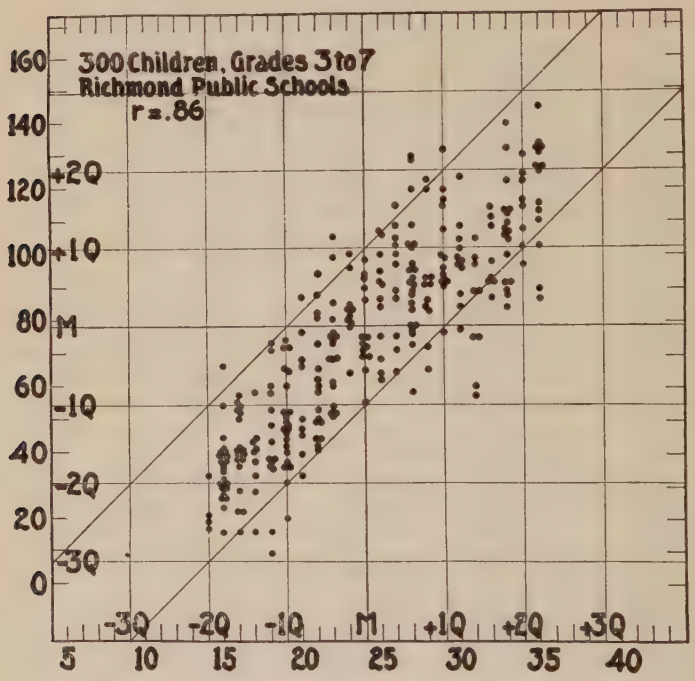

Figure 16.—Correlation graph, showing relationship of scores in general intelligence examination Delta 2 and criterion (4 × grade location + teacher's rating in intelligence). 300 children, Grades 3–7, Richmond public schools. r = .86. P. E. ± .01

like manner the horizontal lines −1Q, −2Q, and −3Q represent corresponding distances below the median.

"The middle vertical line (M) represents the median criterion score (24). The lines + 1Q, + 2Q, and +3Q represent distances above the median of the criterion score equivalent to one, two, and three times the semi-interquartile range (Q) of the

criterion scores of the 300 children. The vertical lines −1Q, −2Q, and −3Q represent similar distances below the same median."

The dots in the figure represent individual children whose criterion score may be obtained by locating the vertical for each dot on the base line and whose test score is shown on the ordinate at the left.

"All of the dots inclosed within the two diagonal lines represent children who do not differ in their relative standing in one test from their relative standing in the other test by an amount greater than the semi-interquartile range in either test. The children represented by the dots outside the diagonal lines represent cases which do differ in one test from the median score in that test by an amount relatively larger than the variation which they achieve in the other test. To put it in another way: The dots within the diagonal lines represent children who are grouped in approximately the same manner by the two measures used. The dots outside the diagonal lines show children who are given different relative standings by the two measures. The fact that relatively few dots are found outside the diagonal lines indicates that the scores in the two measures give approximately the same kind of classification."

An illustration drawn to the same pattern and based on New York data may be seen in Figure 17. Figure 17 represents the correlation between the scores in Delta 2, shown on the ordinate, and the criterion scores for 200 eighth grade pupils in Erie County. These two hundred include all the Erie County eighth graders for whom all the achievement test scores are available. The criterion in this case is the sum of all the achievement test scores. These include reading, spelling, addition, multiplication and two tests in American history. The maximum criterion score possible is 342; the actual maximum is 304 and the median is 193. The coefficient turns out in this case to be .71 ± .0243.

A similar correlation graph is shown in Figure 18, based on the results for 232 twelve-year-olds who were in the schools of Westchester County. The twelve-year-olds in grades 2, 3, 4, and 9 are omitted, since the reading scores are not available for them. The

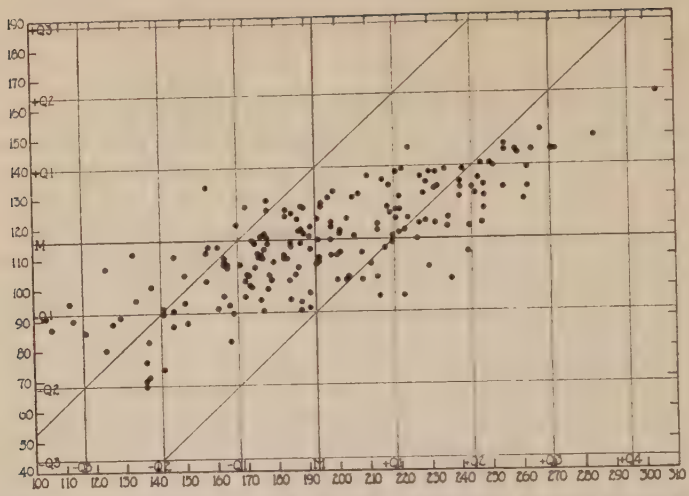

Figure 17.—Correlation graph showing relationship between scores in intelligence examination Delta 2 and criterion scores (the sum of all achievement tests), 200 eighth-grade pupils in Erie County

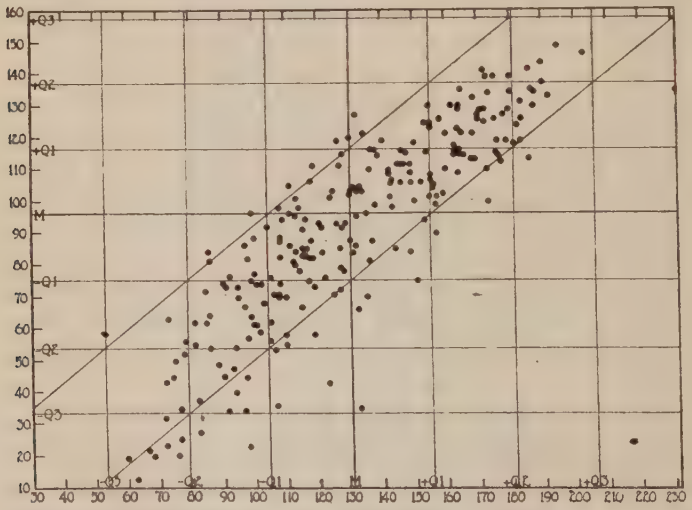

Figure 18.—Correlation graph showing relationship between scores in intelligence examination, Delta 2 and criterion scores [the sum of: grade location × 10, teacher's rating for scholarship (equated 5 = 9, 4 = 7, 3 = 5, 2 = 3, 1 = 1) and scores in reading]; 232 twelve-year-olds of Westchester County

criterion, in this case, the scores of which are shown along the base of the figure is derived from the summation of the following items:

Grade location × 10
Teacher's rating for scholarship
Scores in reading

In this case the "grade location" is multiplied by 10, the reading is included in terms of the gross scores and the teacher's rating for intelligence as given in the record is equated according to the following scale:

5 = 9
4 = 7
3 = 5
2 = 3
1 = 1

The maximum score possible from this combination is 238; the actual maximum is 205 and the median for the group is 130. The figures along the left ordinate are scores in the Delta 2 test.

The figure is drawn after the same pattern as that of Figure 16, the diagonal lines enclosing all the cases which are similarly classified by the two measures within the range of the quartile deviation.

Stenquist's Findings

The Delta 2 examination has been frequently used with other group intelligence examinations. Stenquist reports[1] the results of an extended investigation of the validity of group intelligence examinations of which the Delta 2 was one. In this study a criterion composed of the sum of all the test results was used as a measure of each test. The coefficients of correlation for each test with this criterion are as follows:

Haggerty, Delta 2	r = 0.808 (n = 532)
National A	r = 0.801 (n = 560)
National B	r = 0.788 (n = 518)
Otis (Advanced)	r = 0.680 (n = 551)
Visual Vocabulary	r = 0.680 (n = 461)
Kelley-Trabue	r = 0.58 (n = 581)
Meyers Mental Measure	r = 0.48 (n = 544)
Woody-McCall Arithmetic	r = 0.39 (n = 298)

[1] Stenquist, John L. Unreliability of Individual Scores in Mental Measurements. Journal of Educational Research, Vol. IV, p. 347 ff.

The coefficient for the Delta 2 is as high as that for any test, slightly higher than some and very much higher than others. Stenquist also reports correlations for Delta 2 with other group tests as follows:

National Scale A, 500 cases in grades 4 to 8.....r = .81 ± .01
Otis Advanced, 500 cases in grades 4 to 8.....r = .59 ± .02
National Scale B, 50 cases.....r = .69 ± .04

Miller's Data

Miller reports a study in which he used as a criterion the sum of the scores in the Miller Mental Ability test, the Intelligence Examination, Delta 2, and the Terman Group Test of Mental Ability, Form A. The coefficients of correlation are shown in the following table:

Table 24.—Correlations (Pearson) of Miller Test With Other Tests and With School Marks. 55 Ninth-Grade Pupils, University of Minnesota High School

	Delta 2	Terman Form A	Alpha Form 8	Mentimeters	Av. First 3 Tests	Av. Five Tests	School Marks (12) Weeks	Otis Test
Miller.....	.784	.747	.76	.768	.891	.903	.563	.734
Delta 2.....	..	.817	.778	.685	.904	.884	.503	.715
Terman, Form A	..	..	.823	.714	.931	.929	.586	.741
Alpha, Form 8...	..	..	..	.712	.842	.914	.564	.716
Mentimeter.....	..	..	..	..	.779	.842	.409	.654
Av. First 3 tests .	..	..	..	..	..	.975	.562	..
Av. 5 tests above	..	..	..	..	..	..	.60	.841

All correlations are positive.

On the basis of tests given by Dickson in the Oakland Schools, the Delta 2 shows a coefficient of .65 ± .039 with the army Alpha. From the same data the coefficient of correlation with the Stanford Revision of the Binet Scale has been found to be .84 ± .018. Similar figures have been furnished the writer by Superintendent Bliss, Dr. Elizabeth Woods and others.

Study by Franzen

A more crucial examination of the value of the Delta 2 test has been made by Dr. Raymond Franzen in a study[1] involving fourteen group intelligence examinations. All of the tests were given to the same group of 57 first year high school pupils. Each of the tests was checked against a criterion composed of the sum of the scores in all the tests. The results were presented in successive tables showing the correlation of each test with the total, the correlations of each test with the other thirteen, and the intercorrelations of all tests with reading ability (Thorndike Alpha 2) rendered constant, the correlations with average marks in first semester in high school, correlations with the teachers' judgments, and with age at high school entrance. From all these data Franzen concludes as to the value of the tests. The Delta 2 he includes along with the Otis and the National tests, all of which "give a fairly good account of themselves" in all of the tables.

In interpreting this conclusion of Franzen's it should be kept in mind that the Delta 2 was originally intended for the intermediate and grammar grades. This demonstration of its value for high school pupils notably extends its usefulness.

Gates' Study

Gates,[2] reporting a recent study on the relation of achievement in school subjects to the scores in intelligence tests, cites the correlation of each of 14 intelligence tests with each of the others and the correlation of each with a composite measure of achievement in school subjects. He finds only two tests with a higher mean intercorrelation than the Delta 2. The advantage of one of these which requires a third more time in giving is only .01 and of the other which requires more than double the amount of time is but .05. Only two of the group examinations requiring as small an amount of time (National A and National B) show as high correlations with the composite of achievement. It shows practically the same corre-

[1] Unpublished manuscript.

[2] Arthur I. Gates. The correlations of achievement in school subjects with intelligence tests and other variables. Journal of Educational Psychology, Vol. XIII, p. 223.

lation to the composite of achievement (.52) as does the Stanford Revision of the Binet test and no group examination employing so small a measure of time showed quite so high a correlation with the Stanford Mental Age.

Important figures collected from several of Gates' tables here follow:

	1 Time (minutes)	2 Correlation with Stanford Binet	3 Mean r with achievement	4 Mean r with 13 tests
Dearborn Total	80	.58	0.47	44
Otis Advanced	47	.61	0.63	.53
Dearborn 5	45	.49	0.43	.43
Dearborn 4	35	.52	0.38	.41
National Total	33	.51	0.63	.50
Thorndike-McCall	30	.57	0.48	.46
Terman Groups	27	..	0.55	.49
Haggerty, Delta 2	21	.48	0.52	.48
National A	17	.47	0.56	.48
Illinois	17	.45	0.48	.48
National B	16	.45	0.66	.47
Myers	15	.28	0.12	.21
Holley	12	.42	0.43	.37

Too much significance should not be attached to the absolute size of any of the foregoing coefficients of correlation as compared with the coefficients previously quoted. The magnitude of any such coefficient is dependent on a number of factors besides the essential relation existing between two measures. Variations in range and character of distributions affect the size of the coefficient even though the relation between the two measures remain the same. Only when coefficients are calculated on the same or closely similar groups are they directly comparable.

In the light of all these statistical data it may be inferred that the Intelligence Examination Delta 2 has high rank among tests of this type. It is not a perfect measure of ability, either native or acquired, but it is apparently superior to any single achievement test and adds materially to the information which the achievement tests give concerning a school system.

Age Norms in Delta 2

In Table 25 are shown age norms for the Delta 2 examinations based on the results of the test with about 40,000 pupils ranging from grade 3 of the elementary school to the second year of college. These norms are not exact medians for any particular group of individuals. As will be seen later in the case of New York pupils, different groups of pupils of the same chronological age will give different median scores on this test and they will do so on any test of similar type. Thus, twelve-year-old pupils in the one-teacher schools of New York state score 75, whereas pupils of the same chronological age in larger schools score 93, a difference of 18 points. This difference is greater than the difference for a full year's growth as represented by the increase of score over that of eleven-year-olds for either group. These two groups of twelve-year-olds are, however, fairly large and are relatively unselected groups from their several communities. Median scores such as these are taken into consideration in fixing the norms as given in the table.

Similar results from schools of varying types and from widely diverse conditions are also considered. In addition to such comparative studies of median scores for the several chronological ages, the advance shown by large groups from one chronological age to the one next above and to the second above, etc., are considered. Comparison is also made with median test scores for separate school grades having known median ages, and with the score made by pupils in good schools who are of normal age for the grade in which they are found. In the case of the upper ages, the median scores for the several high school grades were of especial value.

From these and other similar considerations the age norms found in Table 25 have been determined. The scores for the intervening months have been fixed by dividing the inter-age differences into twelve equal parts and distributing these along the several months from one age to the one next above. The table, therefore, is a genuine construction and in no sense a reproduction of the median scores for any particular group of children. Certain groups of school children will score uniformly above these norms and certain other groups will score uniformly below them. It is believed, however, that these norms will serve as a fairly accurate point of

TABLE 25.—HAGGERTY INTELLIGENCE EXAMINATION, DELTA 2. AGE NORMS FOR INDIVIDUALS OF AGES 7 TO 20 YEARS. BASED ON ABOUT 40,000 CASES. FIGURES IN FIRST COLUMN OPPOSITE YEARS INDICATE NORMAL SCORES FOR INDIVIDUALS OF EVEN AGES. FIGURES IN SUCCEEDING COLUMNS TO RIGHT INDICATE NORMAL SCORES FOR MONTHS BEYOND EVEN AGES

Ages in years	Norm	Months										
		1	2	3	4	5	6	7	8	9	10	11
7	7	8.1	9.2	10.3	11.4	12	13.5	14.6	15.7	16.8	17.9	19
8	20	21.8	23.6	25.4	27.2	29.1	31	32.8	34.7	36.5	38.4	40.2
9	42	43.3	44.6	46	47.3	48.6	49.9	51.2	52.6	53.9	55.3	56.7
10	58	59	60	61	62	63	64	65	66	67	68	69
11	70	71	72	73	74	75	76	77	78	79	80	81
12	82	83	84	85	86	87	88	89	90	91	92	93
13	94	95	95.9	96.8	97.7	98.6	99.5	100.4	101.3	102.2	103.1	104
14	105	105.9	106.8	107.7	108.6	109.5	110.4	111.3	112.2	113.1	114	115
15	116	116.7	117.5	118.2	119.0	119.7	120.5	121.2	122	122.7	123.5	124.2
16	125	125.5	126.1	126.7	127.2	127.8	128.4	129	129.6	130.2	130.8	131.4
17	132	132.5	132.9	133.3	133.7	134.2	134.6	135	135.4	135.8	136.2	136.6
18	137	137.4	137.7	138	138.4	138.7	139	139.4	139.7	140	140.3	140.6
19	141	141.2	141.5	141.8	142	142.3	142.6	142.8	143.1	143.3	143.6	143.8

reference for pupils of the ages here shown, and, as a point of reference which is constant, they will be serviceable in evaluating the relative abilities of pupils who are examined with this intelligence examination. That such a point of reference shall be fairly within the range of probable error theoretically true for a genuinely unselected group of persons of each chronological age, and that it remain constant, is all that the practical uses of such a table of norms demand.

TABLE 26.—HAGGERTY INTELLIGENCE EXAMINATION, DELTA 2. AGE NORMS FOR INDIVIDUALS OF AGES 7 TO 20 YEARS. BASED ON 40,000 CASES. 7 YEARS = 7 YEARS, 0 MONTHS, TO 7 YEARS, 11 MONTHS

7	8	9	10	11	12	13	14	15	16	17	18	19	20
7	20	42	58	70	82	94	105	116	125	132	137	141	144

The norms given for ages 7 and 8 are to a degree fictitious. The test is not designed for pupils so young as normal children of these ages. The figures are printed here as convenient points of reference for older pupils who make low scores. This statement is but slightly less true for ages 18 to 20. All pupils of these latter ages who are still in school are a group from which almost all the pupils of inferior ability have been eliminated. They are a selected group, how highly selected no one can easily say. In the Delta 2 test, the scores show slight increases from age to age of these higher age groups. The curve does not take full advantage of these increases, on the supposition that they are in part due to a selection of the better individuals. In accordance with the general belief that the growth in intelligence stops or slows up in the neighborhood of 16 years, the upper limits of the age curve have been arbitrarily flattened more than the median scores would seem to warrant.

Mental-age-grade tables (44–44c) based on these norms for New York school children are found on pages 130–133.

A mental growth curve based on this table of norms is found in figure 19. The figures along the left ordinate indicate the scores in the test. The successive chronological ages with the inter-age

month intervals are given along the base line. The curved line represents in terms of these two factors the mental growth which an individual makes with increasing chronological age.

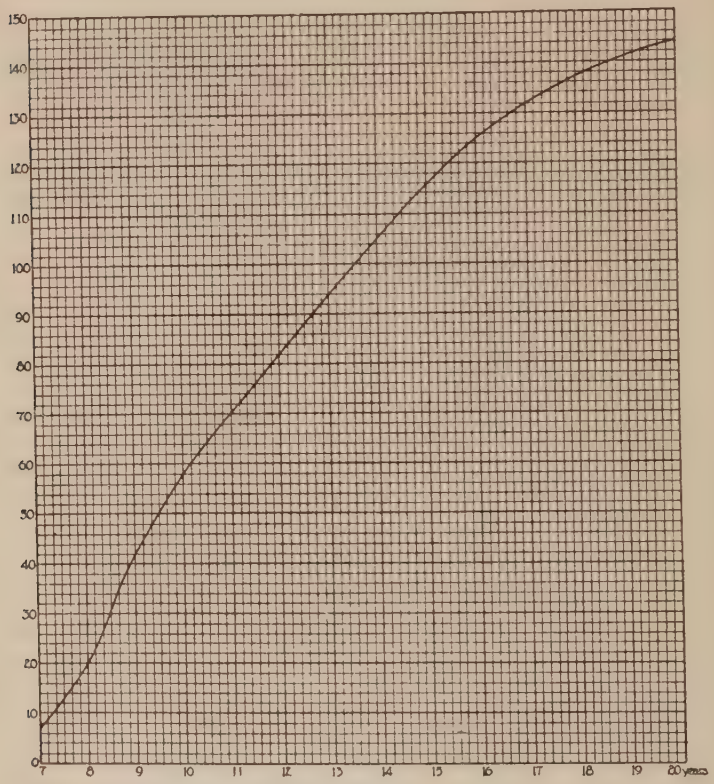

Figure 19.—Intelligence examination, Delta 2. Mental growth curve. Figures on left ordinate indicate score. Figures on base line indicate chronological age

The reliability of the norms given in Table 25 will be evidenced by the list of intelligence quotients given herewith. These quotients are for 998 pupils in grades 3 to 9 of one school system, being all the pupils in the system in these grades. The median I. Q. for the entire group turns out to be 98.3.

I. Q.	Cases
46–50	2
51–55	..
56–60	1
61–65	7
66–70	17
71–75	46
76–80	55
81–85	88
86–90	108
91–95	118
96–100	118
101–105	118
106–110	90
111–115	63
116–120	56
121–125	43
126–130	23
131–135	14
136–140	13
141–145	18
Total	998
Median	98.3

Miller Mental Ability Test

The Miller Mental Ability Test[1] is an examination composed of three tests. The first is a combined disarranged sentence and written directions test; the second is a combined vocabulary and controlled association test; the third is a modified mixed relations or analogies test. Each test is composed of 40 items arranged in an order of difficulty beginning with easy exercises. The later items in each test are very difficult. The time required for the test is about 40 minutes, the total possible score is 120 points, and the test may be used for pupils in grades 7 to 12 inclusive.

This test has had considerable use with high school pupils. Dr. Miller gives the following table of results based upon examination of about 6000 high school pupils.

Table 26A.—Percentile Distribution, September Scores. 6236 Pupils, Grades 7 to 12

Year	Cases	0	10	20	30	40	50	60	70	80	90	100
Seventh	1113	1	17	23	27	31	35	39	44	50	58	85
Eighth	978	5	25	32	37	42	46	51	56	62	68	96
Ninth	1515	1	29	37	43	48	53	57	63	69	77	103
Tenth	1011	7	39	47	53	58	62	66	70	76	84	106
Eleventh	880	16	44	52	59	64	69	74	78	83	89	110
Twelfth	739	8	50	58	64	69	74	78	83	87	93	116

[1] Miller, W. S.: Mental Ability Test, Manual of Directions, 1921. World Book Company, Yonkers, New York.

A table showing coefficients of correlation for the Miller Test with other tests has already been given on page 86. With the average of five well-known group intelligence examinations the coefficient is .90, and with high school marks the coefficient is .56.

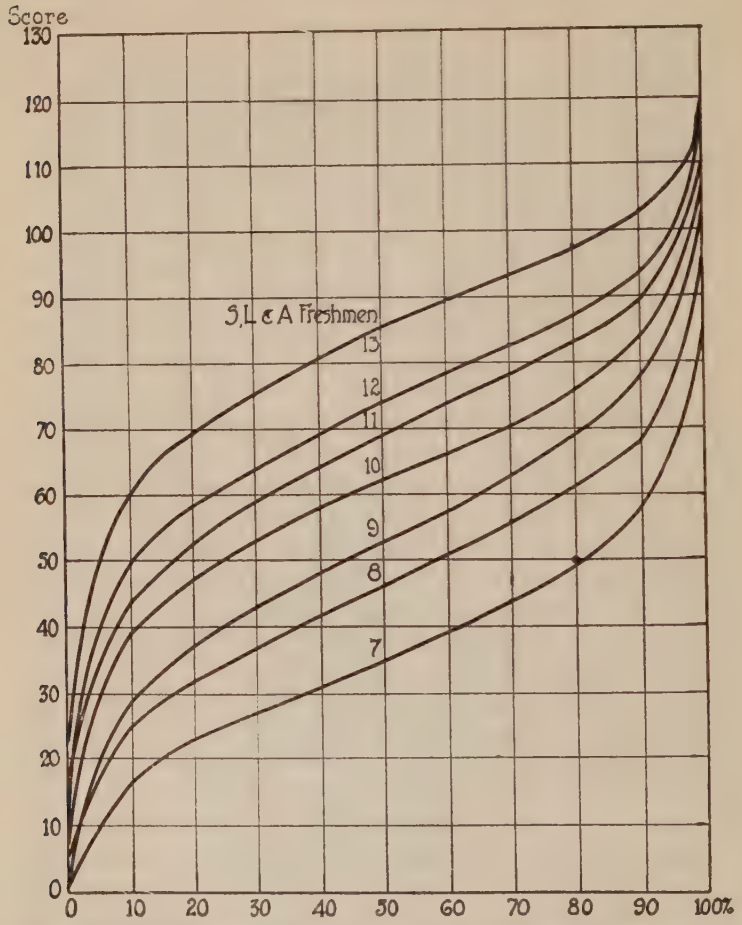

Figure 20.—Miller Mental Ability. Grades 7–12. 6236 pupils. Percentile graph

The distribution which the Miller test gives for high school pupils may be seen in Figure 20, which gives the percentile graphs based on

TABLE 26B.—COEFFICIENTS OF CORRELATION OF TEST RESULTS FROM THE EXAMINATION OF 41 JUNIOR, SENIOR, AND GRADUATE COLLEGE STUDENTS. P.E. RANGES FROM .0104 FOR A CORRELATION OF .963 TO .1024 FOR A CORRELATION OF .221

	Miller, B	Miller, A	U. of M.	Mentimeters	Thurstone, IV	Myers M. M.	Otis	Terman	Miller. A + B	Av., 5 + 7	Av., 9 Tests
1. Alpha, Form 8	.744	.734	.773	.715	.686	.345	.718	.714	.769	.595	.912
2. Miller Mental Ability Test, Form B	..	.859	.717	.683	.620	.335	.775	.735	.960	.550	.88
3. Miller Mental Ability Test, Form A	..	..	.709	.613	.568	.303	.704	.622	.963	.515	.847
4. U. of M.	..	..	..	.555	.614	.221	.563	.639	.742	.434	.798
5. Mentimeters	..	..	..	..	.602	.453	.512	.624	.655	.798	.772
6. Thurstone, Test IV	..	..	..	..	..	.313	.595	.561	.616	.517	.774
7. Myers, Mental Measure	..	..	..	..	..	..	.358	.523	.332	.892	.511
8. Otis, Advanced	..	..	..	..	..	..	..	.681	.715	.474	.815
9. Terman, Form A	..	..	..	..	..	..	..	..	.704	.664	.832
10. Miller, A and B	..	..	..	..	..	..	..	..	..	.561	.897
11. Average 5 and 7	..	..	..	..	..	..	..	..	..	..	.73

the data in Table 26a. For each grade the distribution appears to approximate normal, the increase of score from grade to grade is distinct and measurable in amount, and the range within each grade is sufficient to show adequate discriminative capacity in the test. The relation which the Miller test bears to intelligence examinations designed for the upper levels of mental capacity to be found among college students may be seen in Table 26b. Each of the two forms of the Miller test shows a coefficient much above .80 with the average of nine other intelligence examinations.

The relation between the test and the ability to do college work is shown by the following table:

TABLE 26c.—PERCENTAGE DISTRIBUTION OF 2901 COLLEGE FRESHMEN MARKS, ACADEMIC SUBJECTS, FIRST QUARTER 1921–1922, UNIVERSITY OF MINNESOTA

Miller Test, Form A	College marks (12 weeks)							
	F.	Dr.	I.	E.	D.	C.	B.	A.
Highest One-fourth	5.9	1.1	2.0	2.8	16.0	36.1	24.4	11.6
Second One-fourth	11.1	2.2	0.4	5.7	22.5	38.5	15.8	3.7
Third One-fourth	16.5	3.4	1.3	6.6	24.0	35.5	10.8	2.0
Lowest One-fourth	21.4	7.3	1.9	8.5	26.2	29.0	5.0	0.7
Average of total	14.0	3.0	1.0	6.5	22.0	35.0	14.0	4.5

Paterson[1] has found that with a group of 90 sophomores in a course in experimental psychology at the University of Minnesota the Form A of this test, the one used in the survey, shows a coefficient of correlation with the Thorndike intelligence examination for high school seniors of .82.

Miller[2] gives the following method of figuring an intelligence quotient:

"To translate a score in this test into an approximate intelligence quotient, determine first the mental age by allowing two months for each point above 20 in the score and add this to ten

[1] Unpublished manuscript.

[2] Miller Manual of Directions.

years or 120 months which is allowed for a score of 20. Then divide this mental age in months by the chronological age in months; the quotient will be the approximate intelligence quotient.

"Expressed in a formula, $IQ=\frac{120 + 2\ (S - 20)}{CA}$, where S is total score on test and CA is the chronological age in months.

"By removing the parentheses the formula may be simplified to read: $IQ=\frac{2S + 80}{CA}$. This means that the mental age in months can be obtained by doubling the score and adding 80.

"It should be emphasized that intelligence quotients determined in this manner are only an approximation and should be so interpreted.

"High school pupils with scores below 20 have in all probability not fully understood the directions, or have not taken the test seriously. Before concluding that their ability is as low as such a score would indicate, they should be re-examined on this test or on some other group test, or their IQ should be determined by use of the Stanford Revision of the Binet-Simon Test."

By the use of this method the median intelligence quotients for the three grades of a senior high school not included in the group from which the norms were determined are as follows:

Grades		
X	XI	XII
114	112	120

Correlations for Reading Examination, Sigma 3

Inasmuch as we shall have occasion to refer to the results of the reading examination, Sigma 3, in connection with the results of the intelligence examination, a further word concerning it will be here in order. A table (Table 27) of coefficients of correlation of each of the three tests composing this examination with the total score and the intercorrelations among the several tests is here given.

It is clear from this table that the several tests measure only in part the same functions. The average of the coefficients of inter-

correlation is .563. The self-correlation of each of the tests is very much higher than this. In a different group of somewhat wider range the coefficients of self-correlation derived by a second trial of the same examination are as follows: Entire examination, .89; vocabulary, .87; sentence reading, .77; and paragraph reading, .81 (126 cases from grades 5 to 8 inclusive). The several tests evidently supplement each other by measuring different reading abilities.

TABLE 27.—READING EXAMINATION, SIGMA 3: CORRELATIONS OF SEVERAL PARTS OF EXAMINATION WITH THE TOTAL SCORE, AND INTERCORRELATIONS AMONG THE SEVERAL TESTS. 442 CASES OF HIGH SCHOOL STUDENTS

		Total		Test 1		Test 2		Test 3	
Total	r =	..	..	.63	..	.75	..	.78	..
	P.E. =	..	..	..	±.02	..	±.014	..	±.012
Test 1	r =	.63	..	..	..	.56	..	.59	..
	P.E. =	..	±.02	..	..	..	±.024	..	±.023
Test 2	r =	.75	..	.56	..	..	..	.55	..
	P.E. =	..	±.014	..	±.024	..	..	..	±.024
Test 3	r =	.78	..	.59	..	.55	..	..	..
	P.E. =	..	±.012	..	±.023	..	±.024	..	..

An examination of the coefficients of correlation of each of the three tests with the total score indicates that the paragraph reading test contributes most to the total score and that the vocabulary test contributes least. The former coefficient is .78 ± .012 and the latter is .63 ± .02. The sentence test is intermediate with a coefficient of .75 ± .014. This order of relation is probably the desirable one for a satisfactory measure of reading achievement.

RELATIONS AMONG THE THREE EXAMINATIONS

The relation which the reading examination bears to the intelligence examinations may be seen in Table 28, which gives not only the coefficients of correlation for the Sigma 3 examination with the Delta 2 and the Miller tests, but also the coefficients for the several combinations of these three examinations. Each of these three examinations gives higher self-correlations than any coefficient

shown in this table. The facts for the Delta 2 are reported in the Virginia Public Schools[1] as follows:

"The best evidence, however, of the reliability of the Delta 2 examination was obtained by a repetition of the entire test in one school. In this school 129 children in grades three to six inclusive were tested about 10 o'clock in the morning; about 2 o'clock in the afternoon of the same day, the same children were given the same test. In the second trial the children gained on an average twelve points, and the coefficient of correlation between the scores of the two trials was .90 ± .01. The several tests showed coefficients of self-correlation ranging from .71 to .86."

TABLE 28.—COEFFICIENTS OF CORRELATION BASED ON 442 CASES OF 9TH GRADE PUPILS IN LARGE HIGH SCHOOLS, INVOLVING INTELLIGENCE EXAMINATION DELTA 2, READING EXAMINATION, SIGMA 3, AND MILLER MENTAL ABILITY TEST

		Delta 2	Sigma 3	Delta 2 and Sigma 3	Miller
Delta 2	r =	..	.62	.92	.61
	P.E. =	..	± .021	± .006	± .021
Sigma 3	r =	.62	..	.85	.79
	P.E. =	± .021	..	± .009	± .012
Delta 2 and Sigma 3	r =	.92	.85	..	.55
	P.E. =	± .006	± .009	..	± .025
Miller	r =	.61	.79	.55	..
	P.E. =	± .021	± .012	± .025	..

The results for a repetition of the Sigma 3 examination are reported in the Manual of Directions as follows:

"The Sigma 3 test was given to 126 pupils in Grades 5C to 8A on one day, and the test was repeated two days later. The correlation between the two trials was .885. The several tests showed self-correlations as follows: Vocabulary, .865; Sentence, .769; and Paragraph, .806. The average increase in score was about 5 points."

That the Miller test is a dependable measure is evident from the coefficients of correlation. Based on the results of two trials on

[1] Virginia Public Schools, Part 2, page 122.

successive days of the same form of the test with 109 high school sophomores, the coefficient of self-correlation is .88. The Pearson coefficient of variation for the distributions on the two trials of the test were 20.5 and 19.1 respectively.

From the coefficients given in Table 28 and from the coefficients of self-correlation for each of the several tests, it may be inferred that these several examinations supplement each other by measuring to some degree different abilities. The highest coefficient for any two of the tests is .79 for the Miller and the Sigma 3; and lowest for the Delta 2 and the Miller with a figure of .61. The probable errors for these coefficients are all small.

A combination of the scores from all these tests would seem to be a more complete measure of an individual than any one of them alone would be. Together they require about two hours of a pupil's time.

Attention may be called to the fact that each of the tests require reading ability on the part of the pupil. Those unable to read will score zero in both the Miller and the Sigma 3 tests. On the Delta 2 they can score a maximum of 20 points and only that by doing the picture completion test perfectly. Whatever abilities pupils may possess which are not measured by tests requiring reading ability escape evaluation by these tests.

CHAPTER V

GROUPING OF PUPILS

NOW that we have given consideration to the evaluation of the tests, we may turn to certain problems upon which the test results bear. First, we shall deal with the classification of pupils for instructional purposes. Undoubtedly the basic reason for such grouping is that instruction may thereby be improved. It is assumed that pupils of like minds, or of like stage of mental development, or of like previous training may be more efficiently instructed in groups than can pupils who differ greatly in these matters. The range of desirable variation is definitely fixed in the practice of most school systems.

"How widely may the pupils of a single class vary in mental ability without interfering seriously with effective class instruction? The answer given to this question by the vast majority of good schools the country over is, 'Less than six months.' In this period of time normal children make a sufficient growth that promotion to a higher grade is justified. In cities, generally, there is a regrouping of pupils at the end of every semester or at the end of each four and one-half months of school work. A number of schools make the readjustment three times a year or at intervals of three months. This is true in Minneapolis and St. Louis. The city schools in New York use the four and one-half months' interval.

"Presumably what is implied in this practice is that a normal child in four and one-half months undergoes a sufficient mental growth to require a new grade classification, new subject-matter, different methods of instruction, different work periods, and different social conditions. It should be emphasized that current practice recognizes to some extent that this mental development is not the exact counterpart of changed chronological age. It assumes a mental growth that is sometimes retarded, sometimes accelerated, and exactly correlated with chronological change in only about fifty percent of the cases."[1]

[1] Virginia Public Schools, Part 2.

This generally accepted standard of grouping should be kept in mind while conditions in the New York rural schools are examined, because, whether we check existing conditions by intelligence tests, achievement tests, or by any other objective measure available, it is obvious that there is wide variation from the ideal stated in the above quotation. How much it is possible to reduce the excessive variation is an unsolved problem for schools, and any discussion of the matter must have due consideration to the complex nature of the factors involved.

Cautions in Interpretation of Test Data

At the outset it seems desirable to express emphatic caution against the assumption so frequently made in current discussion and practice that intelligence tests are a complete substitute for all other methods of pupil grouping. Only a superficial appreciation of the facts will permit such practice where additional criteria are available.

In particular, it should be emphasized that a single intelligence test requiring ten, twenty or thirty minutes is an inadequate basis for a satisfactory grade allocation of an individual pupil. By any single group test, even when applied under standard conditions, a particular child may be misplaced by a half year, a whole year and, in some cases, even more in the capacities which intelligence tests aspire to measure. This fact has long been recognized by those working in the field of intelligence examinations, but has been frequently overlooked in the practical effort to improve pupil grouping speedily. While in general the intelligence test score made by a pupil adds greatly to our knowledge of that pupil's ability to do school work, there is nothing in the results of intelligence test investigations that justifies the discard of other sources of information, such as teachers' judgments, teachers' marks, scores in achievement tests, etc., or even the surrender of common sense on the part of school officers when the grade location of a particular child is at stake.

It may not be out of place to stress another matter which is receiving emphasis in current discussion, namely, the determination and significance of certain character traits, emotional and volitional

attitudes, such as industry, perseverance, personal, intellectual and social interests, and a number of others. For this general field of non-intellectual traits we have as yet no adequate psychological analysis and no adequate means of measurement. The development of the intelligence tests has, however, enabled us to define, by process of exclusion, the existence of such a mental realm more definitely than was hitherto possible. Of its great significance there can be no reasonable doubt. To know what a man wants is often more valuable information about him than is a nicely scaled record of his intelligence, and the psychology of desire in childhood and the technique of its direction are probably of more practical importance for eighty percent of our children than is all our information concerning their intelligence.

Even with the limitations—here freely admitted—of our intelligence tests results, it still is true that an intelligence test score is probably the best single *measure* available to show the range of abilities existing within a school system, and where we are considering children in groups, the interpretation of our data will not do violence to any individual pupil or even to any individual school. It is believed that the massing of the data in the distribution tables which follow reflects the existence of school conditions which can be and should be greatly improved.

Distribution of Scores in Delta 2 Examination

The complete distributions of scores for the Delta 2 examination for the several types of schools are given in the tables immediately following. The data are given separately for one-, two-, three-, and four-teacher schools. In each table the figures in bold face in each grade column indicate the group containing the median individual.

A superficial study of these tables will indicate a very large amount of overlapping from grade to grade. In view of the relatively high reliability and validity of the examination this is a significant showing. It means that there are pupils in the lower grades who, in terms of the test, are able to do the work of the grade next above, and in some cases, the work of two and three grades above. Thus, in Table 29, which shows the results for the larger schools, there are 59 pupils in grade 5 who score 105 points or

TABLE 29.—INTELLIGENCE: DELTA 2. FOUR-TEACHER SCHOOLS. GRADES 3–8. DISTRIBUTION OF SCORES BY GRADES. MEDIAN SCORE AND AGE FOR EACH GRADE

	Grades					
	3	4	5	6	7	8
0	..	..	..	..	..	..
1–5	5	3	1	..	..	..
6–10	6	5	..	..	..	..
11–15	14	8	2	..	..	..
16–20	21	19	5	..	..	..
21–25	37	19	11	2	..	..
26–30	45	34	8	2	1	..
31–35	47	34	17	5	2	..
36–40	**48**	41	18	5	..	..
41–45	45	51	20	11	2	..
46–50	32	69	37	6	2	..
51–55	30	70	36	12	2	..
56–60	17	**61**	41	21	4	2
61–65	17	66	43	32	8	..
66–70	21	64	52	36	16	3
71–75	12	37	**61**	41	28	5
76–80	3	33	54	48	21	10
81–85	5	34	55	62	26	7
86–90	4	31	36	70	31	25
91–95	2	23	52	**70**	60	34
96–100	1	14	34	46	54	41
101–105	..	4	27	66	**44**	49
106–110	..	2	18	52	58	53
111–115	..	4	20	36	59	**62**
116–120	..	2	8	32	49	51
121–125	..	..	4	18	35	57
126–130	..	..	4	17	38	52
131–135	..	..	5	12	24	37
136–140	..	..	..	6	11	38
141–145	..	..	..	5	7	19
146–150	..	..	..	..	2	13
151–155	..	..	..	..	1	7
156–160	..	..	..	..	2	..
161–165	..	..	..	..	..	1
Total	412	728	669	713	587	566
Median score	39	57	75	91	104	115
Median age	9.2	10.5	11.6	12.5	13.5	14.4

TABLE 30.—INTELLIGENCE: DELTA 2. THREE-TEACHER SCHOOLS. GRADES 3–8. DISTRIBUTION OF SCORES BY GRADES. MEDIAN SCORES AND MEDIAN AGE FOR EACH GRADE

	Grades						Total
	3	4	5	6	7	8	
0	..	..	..	..	..	..	..
1–5	..	..	..	..	..	..	..
6–10	5	..	..	..	..	..	5
11–15	5	..	..	..	..	..	5
16–20	14	..	..	..	..	..	14
21–25	11	..	..	..	..	..	11
26–30	11	2	2	..	..	..	15
31–35	**10**	..	3	..	..	..	13
36–40	10	4	..	..	..	..	14
41–45	10	5	4	1	..	..	20
46–50	11	8	8	..	1	..	28
51–55	6	8	3	..	..	..	17
56–60	3	5	8	1	..	..	17
61–65	4	**9**	10	1	..	1	25
66–70	..	8	5	3	..	..	16
71–75	2	9	**11**	3	3	3	31
76–80	..	4	10	3	1	1	19
81–85	..	2	16	4	4	2	28
86–90	1	1	6	**8**	6	3	25
91–95	..	1	8	1	7	8	25
96–100	..	1	3	4	**6**	4	18
101–105	..	..	3	2	4	**7**	16
106–110	..	1	3	3	2	3	12
111–115	..	..	1	1	3	4	9
116–120	..	..	1	3	1	2	7
121–125	..	..	..	1	5	2	8
126–130	..	..	..	3	1	3	7
131–135	..	..	..	..	3	4	7
136–140	..	..	..	..	1	1	2
141–145	..	..	..	..	..	..	..
146–150	..	..	..	..	..	..	..
151–155	..	..	..	..	1	..	1
Total	103	68	105	42	49	48	415
Median score	33.7	62	75.3	89	98	102.4	72
Median age	9.7	10.65	12.8	13	13.6	14.6	..

TABLE 31.—INTELLIGENCE EXAMINATION: DELTA 2. TWO-TEACHER SCHOOLS. GRADES 3–8. DISTRIBUTION OF SCORES BY GRADES. MEDIAN SCORE AND MEDIAN AGE FOR EACH GRADE

	Grades						Total
	3	4	5	6	7	8	
0	1	..	..	..	..	..	1
1–5	7	..	..	..	..	..	7
6–10	4	..	..	..	..	..	4
11–15	10	2	1	..	..	..	13
16–20	9	2	2	..	..	..	13
21–25	7	4	1	..	..	..	12
26–30	18	4	..	..	..	..	22
31–35	**15**	6	3	..	..	..	24
36–40	11	6	4	..	..	..	21
41–45	5	8	5	..	..	..	18
46–50	11	**12**	6	1	..	..	30
51–55	8	4	9	5	2	..	28
56–60	2	4	10	2	..	..	18
61–65	2	6	**17**	6	1	..	32
66–70	2	7	8	3	3	..	23
71–75	2	3	6	9	3	2	25
76–80	..	2	8	4	3	1	18
81–85	1	1	5	**5**	4	4	20
86–90	..	1	3	6	10	2	22
91–95	..	..	2	7	6	6	21
96–100	..	..	1	6	**5**	4	16
101–105	..	..	3	4	4	7	18
106–110	..	..	..	2	6	**6**	14
111–115	..	..	..	4	2	7	13
116–120	..	..	1	2	7	7	17
121–125	..	..	1	..	3	5	9
126–130	..	..	1	2	2	2	7
131–135	..	..	..	..	1	3	4
136–140	..	..	..	..	1	2	3
141–145	..	..	..	..	..	..	..
146–150	..	..	..	..	1	..	1
Total.....	115	72	97	68	64	58	474
Median score...	31.5	47.66	63.2	85	96	108.5	65
Median age.....	9.6	10.7	13.4	12.8	13.8	14.8	..

TABLE 32.—INTELLIGENCE EXAMINATION: DELTA 2. ONE-TEACHER SCHOOLS. GRADES 3–8. DISTRIBUTION OF SCORES BY GRADES. MEDIAN SCORE AND AGE FOR EACH GRADE

	Grades						Totals
	3	4	5	6	7	8	
0	4	1	..	..	..	..	5
1–5	19	4	..	..	..	..	23
6–10	33	5	2	..	..	..	40
11–15	54	25	1	..	..	..	80
16–20	60	21	5	..	..	..	86
21–25	58	29	10	3	..	..	100
26–30	**61**	51	5	3	..	..	120
31–35	35	41	11	3	2	..	92
36–40	34	59	21	7	2	..	123
41–45	34	**48**	27	10	1	..	120
46–50	17	45	27	15	3	..	107
51–55	13	45	45	13	2	1	119
56–60	12	42	43	19	6	1	123
61–65	3	43	**47**	39	16	2	150
66–70	3	15	47	44	13	6	128
71–75	3	19	41	35	10	9	117
76–80	2	15	46	48	20	5	136
81–85	1	10	18	**52**	25	18	124
86–90	..	5	21	38	21	37	122
91–95	..	2	18	34	**46**	35	135
96–100	..	..	11	30	24	36	101
101–105	..	..	3	30	24	**35**	92
106–110	..	1	4	27	22	29	83
111–115	..	..	5	9	13	27	54
116–120	..	..	1	5	13	26	45
121–125	..	..	1	9	12	13	35
126–130	..	..	..	3	7	11	21
131–135	..	..	..	4	7	5	16
136–140	..	..	..	..	..	5	5
141–145	..	..	..	..	..	1	1
146–150	..	..	..	..	..	..	..
151–155	..	..	..	..	..	..	..
156–160	..	..	..	..	..	..	..
161–165	..	..	..	..	1	..	1
Total.....	446	526	460	480	290	302	2504
Median score...	26	44	65	81	94	101	64
Median age.....	9.6	10.5	11.9	12.8	13.4	14.3	..

higher. Since the median score for grade 7, given in this same table, is 104 points, it appears that these 59 fifth graders are equal in ability to the average seventh grade pupil. Conversely, there are

TABLE 33.—INTELLIGENCE EXAMINATION: DELTA 2. FOUR- OR MORE TEACHER HIGH SCHOOLS. GRADES 9–12. DISTRIBUTION OF SCORES BY GRADES. MEDIAN SCORE AND AGE FOR EACH GRADE

	Grades				Totals
	9	10	11	12	
66–70	1	..	..	..	1
71–75	..	..	..	..	.
76–80	2	..	..	..	2
81–85	5	..	1	..	6
86–90	8	..	1	..	9
91–95	10	4	..	1	15
96–100	20	1	2	3	26
101–105	17	6	1	2	26
106–110	26	15	4	2	47
111–115	36	10	5	2	53
116–120	50	15	4	4	73
121–125	**52**	27	6	5	90
126–130	50	21	21	7	99
131–135	48	**36**	18	12	114
136–140	38	28	**22**	27	115
141–145	46	29	20	**17**	112
146–150	26	22	22	24	94
151–155	11	20	12	11	54
156–160	4	9	7	14	34
161–165	1	8	..	7	16
166–170	..	2	..	5	7
171–175	..	1	..	1	2
Totals.....	451	254	146	144	995
Median score...	125	135	136	141	133.2
Median age.....	15.1	16.3	17.1	17.9	..

60 seventh grade pupils who score below 75 points, which is the median score for grade 5. In terms of the abilities measured by this test it is obvious that these 60 seventh grade pupils are much

less capable of doing school work than are the 59 fifth graders noted above. Similar comparisons could be made for other grades and for schools of each type, as represented in the several tables, but

TABLE 34.—INTELLIGENCE EXAMINATION: DELTA 2. FEWER THAN FOUR-TEACHER HIGH SCHOOLS. GRADES 9–12. DISTRIBUTION OF SCORES BY GRADES. MEDIAN SCORE AND AGE FOR EACH GRADE

	Grades				Totals
	9	10	11	12	
76–80	2	1	..	..	3
81–85	2	..	..	..	2
86–90	4	1	..	..	5
91–95	2	..	..	..	2
96–100	12	..	2	1	15
101–105	7	3	1	..	11
106–110	19	1	..	..	20
111–115	13	9	1	1	24
116–120	27	11	2	1	41
121–125	**22**	10	4	2	38
126–130	22	**13**	9	2	46
131–135	23	13	8	10	54
136–140	17	13	**13**	**7**	50
141–145	8	3	8	7	26
146–150	5	8	7	3	23
151–155	1	4	3	3	11
156–160	..	4	2	2	8
161–165	..	1	..	2	3
Totals.....	186	95	60	41	382
Median score...	122	130	136	137	129.2
Median age.....	15.4	15.9	17.3	18	..

since these facts are obvious in the tables themselves it does not seem necessary to stress them here.

They are sufficiently illustrated by the percentile graphs shown in Figures 21–24, which present the figures of Tables 29–34 in graphic form. The points where the curves cross the heavy vertical lines

marked "50" in these figures indicate the median scores for the several grades. For all types of schools these points show distinct improvement in median scores from grade to grade. The extremes of the curves, however, greatly overlap the medians of grades below and above. Thus, in Figure 22 the sixth grade curve for one-room

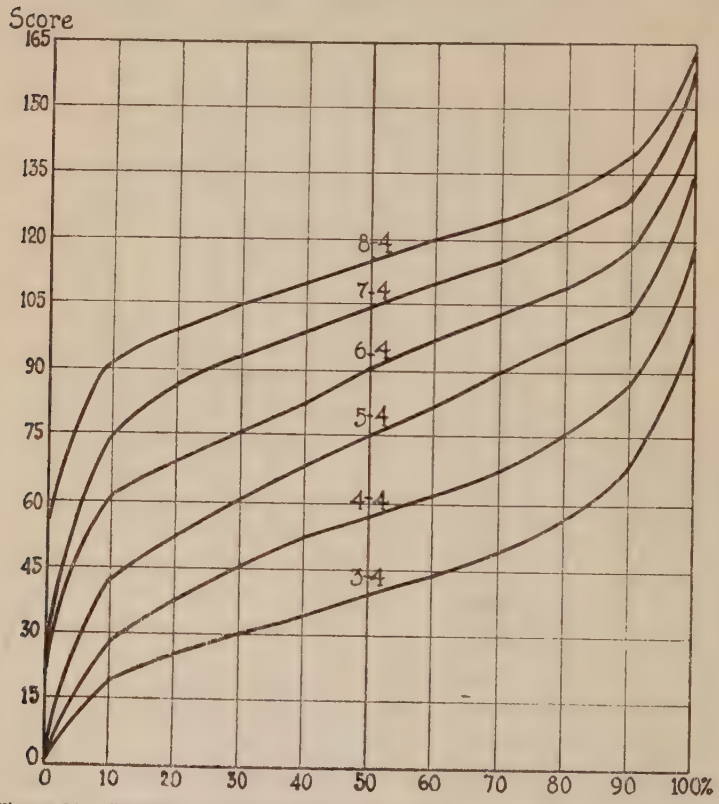

Figure 21.—Intelligence Examination, Delta 2. Four-teacher schools. Grades 3 to 8. Percentile graph

schools shows the upper thirty percent of the distribution to be equal to or above the seventh grade median, and the lower thirty percent to be below the fifth grade median. The reader can observe similar interpretations for each of the curves in each figure.

It is possible to calculate the exact amount of overlapping shown by these tables. We can thus show the percent of each grade which equals or exceeds the median of the grade next above or falls short of the median of the grade next below. Such figures have been

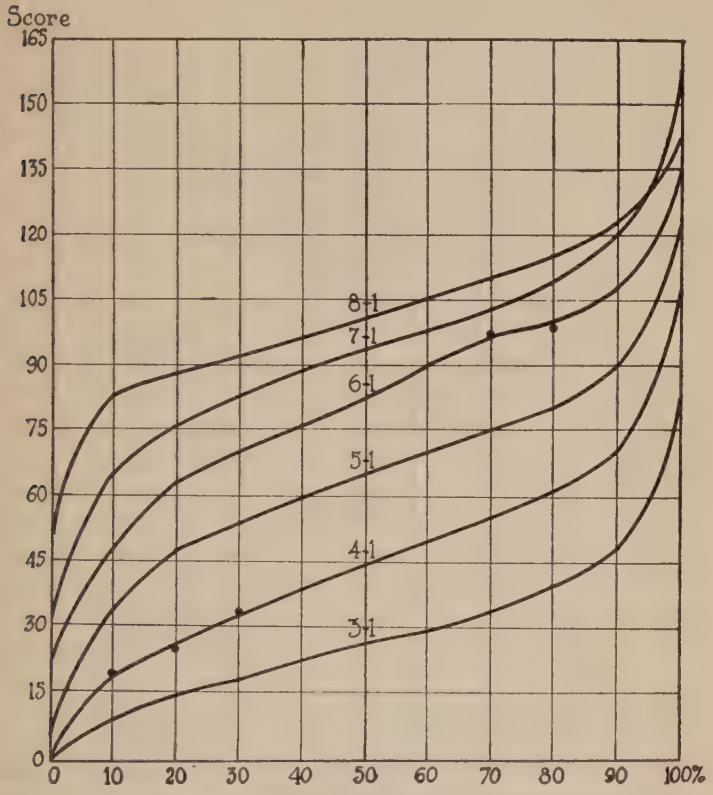

Figure 22.—Intelligence Examination, Delta 2. One-teacher schools. Grades 3 to 8. Percentile graph

repeatedly published for various types of tests and for the Delta 2 examination itself in the Virginia report. In this matter of overlapping no great differences exist as between the several Virginia groups and the New York schools. The figures are also similar to

data derived from 2323 children tested in Aberdeen, Baltimore, Cleveland, Evansville, Indianapolis, Louisville, Rochester, and Santa Anna. The overlapping in the case of these cities is 30.4 percent for each grade, exceeding the median of the half-grade next

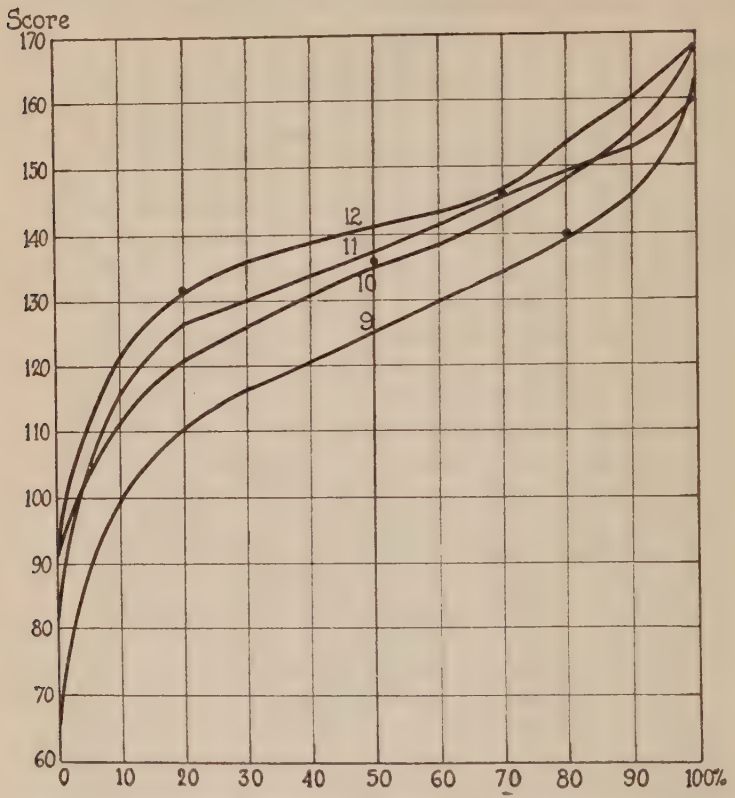

Figure 23.—Intelligence Examination, Delta 2. Large high schools. Grades 9 to 12. Percentile graph

above it, and the amount of improvable classification is 76.6 percent as compared with 81.4 percent in Virginia cities.

The assumption underlying such a statement of improvable classification is that the Delta 2 scores are clear indications of ability to do school work. Such an assumption is subject to definite limitations,

as has been repeatedly pointed out in recent literature. Even if the Delta 2 test were a complete measure of intelligence there are other factors contributing to school success than the skills evaluated by intelligence tests. Among such factors the non-intellectual traits of

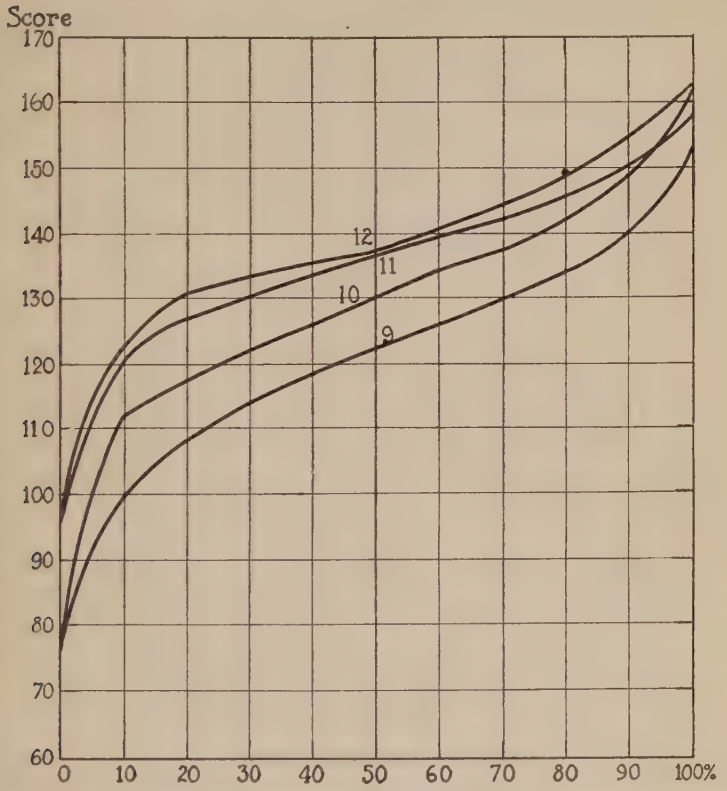

Figure 24.—Intelligence Examination, Delta 2. Small high schools. Grades 9 to 12. Percentile graph

industry, perseverance, energy, social adaptations, as well as previous school experience all play a part in school success. These factors are measured only indirectly by these tests, and results of intelligence examinations must always be interpreted with due reference to these facts.

In just how far such non-intellectual traits are measured indirectly by intelligence tests of the Delta 2 type is an unsolved problem. It has been rather freely assumed in recent discussion that because intelligence tests fail of perfect correlation with school success, the tests do not measure character traits, and that the latter, acting as determinative factors, raise or lower school achievement so that school marks fail of high correlation with test scores. This may be true, but before we can conclude finally that such is the case, we must devise satisfactory measures for each of such character traits, and then by statistical methods partial out the exact contribution which such traits make to school achievement.

Some studies on this problem have already been made. Gates[1] attempted to isolate "school attitude," a term descriptive of a complex of behavior, apparently composed of emotional as well as of intellectual elements. The results of his study seemed to show that in so far as school attitudes are determinative of school achievement they are almost completely measured by intelligence tests.

"The correlation of 'school attitude' with Achievement," he writes, "is little higher (.32) than that between school attitude and Group Tests. It is possible that this correlation with achievement is wholly, or almost wholly, due to the fact that 'School Attitude' as judged by our teachers, and intelligence as measured by our tests are identical, in part. A careful study of the various partial correlations shows this to be true. When the elements of Mental Age and Group Tests which are identical with School Attitude are eliminated ($r_{14.23}$), the residual of school attitudes gives a correlation with Achievement of but 0.12. The unique factors add very little to a composite of Mental Age and Group Tests when each is properly weighted: the multiple r, achievement with (Mental Age + Group) is 0.605, and the multiple r, achievement with (Mental Age + Group × School Attitude) is 0.611.

"It should not be considered that these facts greatly minimize the importance of school attitudes. The significant thing is that in so far as the school attitudes affect achievement in school work, they are almost completely measured by the intelligence tests. The Stanford-Binet measures these attitudes a little better than the

[1] Gates, Arthur I. *Ibid.*

group tests (the partial correlations $r_{14.2} = 0.14$, $r_{14.3} = 0.21$); both tests together account for them almost entirely."

Admitting again the limitation upon the data here offered, it is still true, as experimental education has frequently demonstrated, that these high-scoring pupils in the lower grades are intellectually capable of the work of the higher grades and that the low-scoring pupils are usually doing less than mediocre work even though their school classification calls for something very much better. While the tests may be in error as regards an individual pupil, the error is not great when groups of individuals are considered.

It may be pointed out at this place that intelligence test results are not equally useful for reclassification purposes at all stages of school progress. In the latter part of the seventh grade, for instance, the work depends so definitely upon the curricular content of the first half year that relocation of a pupil is attended with great difficulties. In passing from the third to the fourth grade the difficulties are much less, since a knowledge of exact curricular content is less important and general mental capacity plus silent reading ability is much greater. The introduction of intelligence tests for classification purposes should, therefore, be made with due regard to the nature of the school course. It would seem the part of wisdom to initiate their use at those points where the work to be undertaken was least dependent upon previously learned curricula and where the adjustments could be most easily made. This point in the school course will vary from school to school but in general it should be prior to the beginning of the seventh grade. As a matter of fact, the best place to begin the classification of pupils is in grades one, two, and three, so that classes arriving at the upper grades will be already homogeneous in character.

Distributions in Miller Test

The conditions of classification shown by the Delta 2 examination are also revealed by the results of the Miller tests given in Tables 35–36 for grades 9 to 12 inclusive, for large and small high schools. The percentile graphs are given in Figures 25 and 26. Both from the tables and the figures it is obvious that there is great over-

lapping of ability for these several grades. There are many first year high school pupils who, in the abilities measured by these tests,

TABLE 35.—MILLER MENTAL ABILITY TEST. LARGE HIGH SCHOOLS. GRADES 9–12. DISTRIBUTION OF SCORES BY GRADES. MEDIAN SCORE FOR EACH GRADE

	Grades				Total
	9	10	11	12	
0	..	..	..	..	..
1–5	..	..	..	..	..
6–10	..	..	..	..	..
11–15	..	2	..	..	2
16–20	2	..	1	..	3
21–25	..	2	1	..	3
26–30	10	..	..	1	11
31–35	9	..	2	..	11
36–40	19	3	1	..	23
41–45	20	11	2	..	33
46–50	25	12	5	..	42
51–55	37	17	6	2	62
56–60	49	22	12	1	84
61–65	45	18	7	7	77
66–70	**59**	30	9	6	104
71–75	43	**29**	18	16	106
76–80	39	31	**22**	20	112
81–85	38	26	26	**22**	112
86–90	27	27	19	14	87
91–95	21	16	9	24	70
96–100	6	14	17	17	54
101–105	1	5	4	10	20
106–110	..	3	1	4	8
111–115	..	..	..	2	2
Total.....	450	268	162	146	1,026
Median age.....	15.2	16.3	17.1	17.9	..
Median score...	67	74	80	85	74

are the equals or the superiors of pupils in the second, third and even in fourth year classes.

It may not be inferred, however, that these conditions can be remedied by a radical reclassification of these high school pupils

TABLE 36.—MILLER MENTAL ABILITY TEST. SMALL HIGH SCHOOLS. GRADES 9–12. DISTRIBUTION OF SCORES BY GRADES. MEDIAN SCORE FOR EACH GRADE

	Grades				Total
	9	10	11	12	
0	..	..	..	..	..
1–5	..	..	..	..	..
6–10	..	..	..	..	..
11–15	..	..	..	..	..
16–20	1	..	..	..	1
21–25	2	..	..	..	2
26–30	3	..	..	..	3
31–35	6	..	1	..	8
36–40	6	..	..	..	8
41–45	4	1	1	..	10
46–50	22	3	..	..	27
51–55	15	5	1	1	27
56–60	19	3	6	2	32
61–65	**21**	7	5	4	34
66–70	24	9	9	2	52
71–75	19	14	4	6	44
76–80	16	**19**	**8**	4	48
81–85	13	9	7	1	31
86–90	12	13	10	**10**	37
91–95	8	12	7	7	27
96–100	2	2	5	5	9
101–105	..	1	2	2	3
106–110	..	..	1	2	1
111–115	..	1	..	..	1
Total.....	193	99	67	46	405
Median age.....	15.4	16	17.2	18.1	..
Median score...	65	78	80	88	70.8

following tests such as these. The place in high school where tests results such as these can be most usefully employed is at high school

entrance. In general, pupils begin here a new set of subjects. Foreign language, science, mathematics, literature, history—if not begun here, are, at least, approached in a new way. Aside from the rudiments of the elementary subjects and a basic mastery of English,

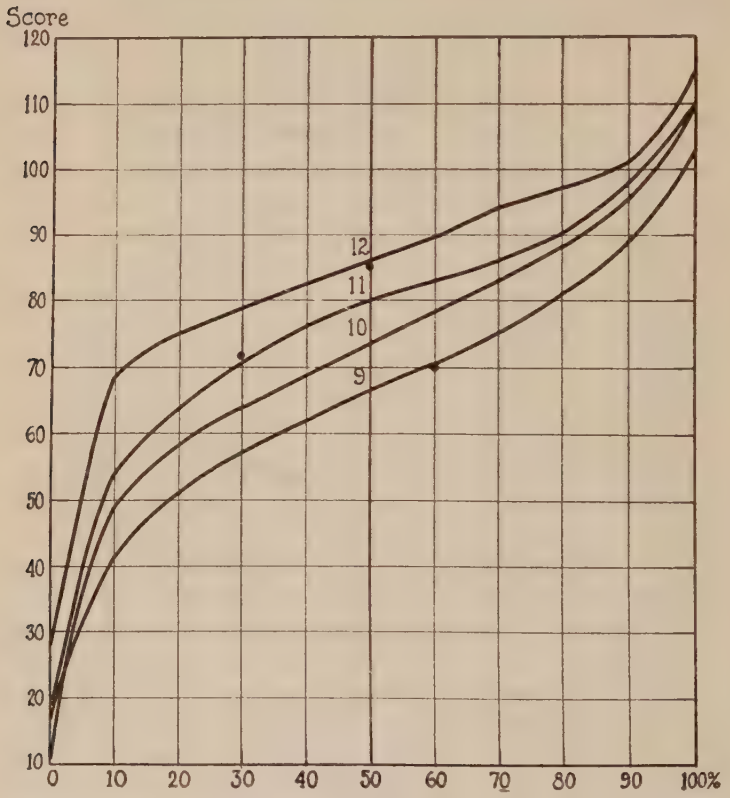

Figure 25.—Miller Mental Ability. Large high schools. Grades 9–12. Percentile graph

much that is taught in the upper grammar grades is not prerequisite in a strict sense to the pursuit of the new high school subjects. General intelligence, therefore, determines more largely than might otherwise be the case just what scholastic hurdles these first year high school students can really go over successfully. If the intelli-

gence factor is given careful consideration in the grouping of students at the beginning and during the first year, and in prescribing curricula, the later high school grouping will be provided for in a better way.

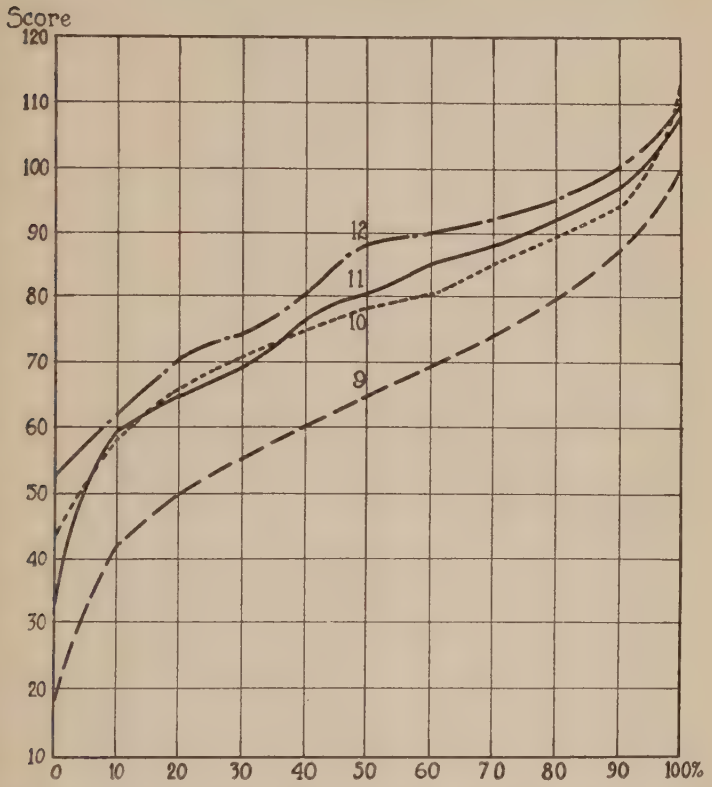

Figure 26.—Miller Mental Ability. Small high schools. Grades 9–12. Percentile graph

Intelligence and Reading Scores Combined

Data similar to that from the Delta 2 and Miller examinations are available also from the Sigma 3 tables given in Chapter III, and from the percentile graph figures printed there. (See page 37 ff.)

The scores for the Delta 2 and Sigma 3 are combined in Tables 37–38. In these tables the strictures on the adequacy of a single examina-

TABLE 37.—INTELLIGENCE EXAMINATION, DELTA 2, AND READING EXAMINATION, SIGMA 3, FORM B: FOUR-TEACHER ELEMENTARY SCHOOLS. GRADES 5 TO 8. LARGE HIGH SCHOOLS, GRADE 9. DISTRIBUTION OF COMBINED SCORES BY GRADES. MEDIAN SCORE FOR EACH GRADE

Score	Grades				
	5	6	7	8	9
31–40	19	..	..	..	..
41–50	10	..	..	..	..
51–60	22	14	..	..	..
61–70	30	16	2	..	..
71–80	39	14	..	1	..
81–90	45	20	5	..	..
91–100	65	38	5	1	..
101–110	68	43	19	..	1
111–120	**69**	45	25	9	2
121–130	57	59	31	10	2
131–140	52	71	29	18	1
141–150	46	**64**	46	29	9
151–160	35	59	47	33	4
161–170	35	56	45	46	18
171–180	26	43	**53**	49	25
181–190	16	41	48	56	29
191–200	10	22	48	**53**	38
201–210	7	28	40	63	35
211–220	5	19	40	45	**56**
221–230	5	10	29	42	57
231–240	1	9	8	36	43
241–250	1	5	14	29	44
251–260	..	4	4	19	33
261–270	..	..	5	8	24
271–280	..	..	..	4	10
281–290	..	..	..	..	3
291–300	..	..	..	..	4
301–310	..	..	..	..	1
Totals.....	663	680	543	551	439
Medians.....	115.4	143.5	174.35	195.0	220.9

tion are to a degree removed. Here we have two examinations which we know measure to some extent the same and to some extent

different abilities, which involve a second examination and which total over an hour of the pupil's time. To a great degree, however,

TABLE 38.—INTELLIGENCE EXAMINATION, DELTA 2, AND READING EXAMINATION, SIGMA 3, FORM B: ONE-TEACHER ELEMENTARY SCHOOLS. GRADES 5–8. SMALL HIGH SCHOOLS, GRADE 9. DISTRIBUTION OF COMBINED SCORES BY GRADES. MEDIAN SCORE FOR EACH GRADE

Score	Grades				
	5	6	7	8	9
41–50	24	10	1	..	..
51–60	27	6	2	..	..
61–70	43	11	2	..	..
71–80	56	22	5	2	..
81–90	60	37	8	1	..
91–100	**62**	38	7	4	..
101–110	53	53	12	7	..
111–120	37	47	23	8	..
121–130	31	**51**	26	18	3
131–140	23	34	28	24	1
141–150	19	36	**30**	29	6
151–160	10	28	24	32	8
161–170	12	26	31	**31**	7
171–180	4	23	13	29	13
181–190	1	7	12	29	16
191–200	2	14	11	21	25
201–210	1	6	11	26	**22**
211–220	1	3	7	4	18
221–230	..	3	7	6	14
231–240	..	..	5	6	19
241–250	..	3	..	1	14
251–260	..	..	..	1	7
261–270	..	..	..	1	2
271–280	..	..	..	..	4
281–290	..	..	..	..	..
291–300	..	..	..	..	..
301–310	..	..	..	..	2
311–320	..	..	..	..	..
Total	466	458	265	280	181
Median	95	122	148	166	206

the tables appear similar to those showing the distributions for each of the examinations separately.

How definite is the increase of scores from grade to grade and yet how great is the overlapping of the several grades appear

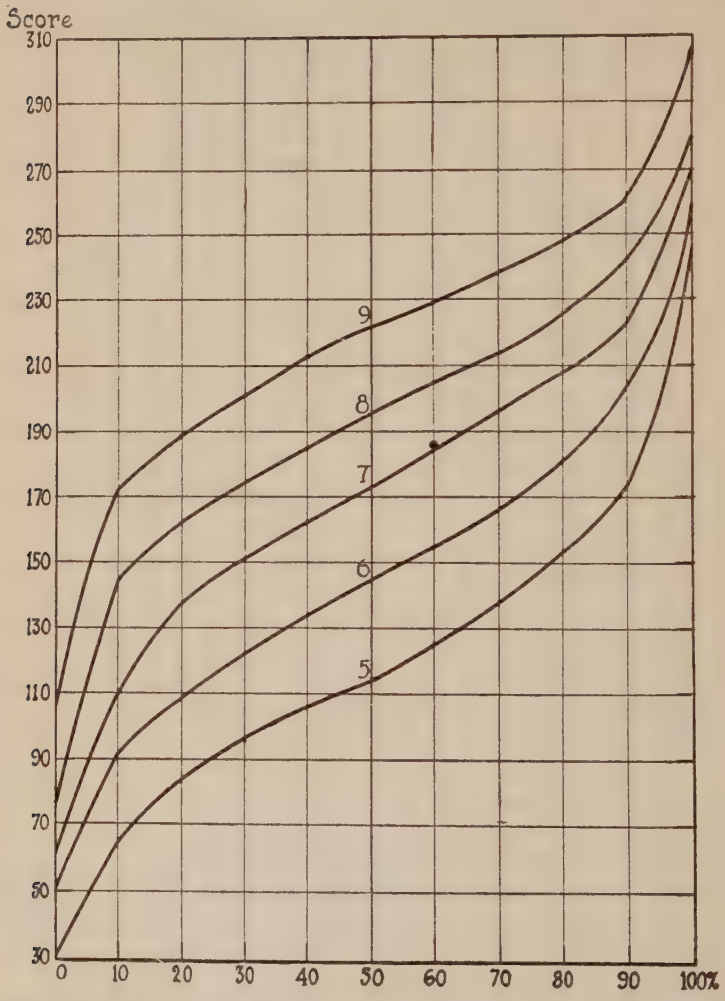

Figure 27.—Intelligence Examination, Delta 2, and Reading Examination, Sigma 3, Form B. Four-teacher elementary schools, Grades 5–8, and large high schools, Grade 9. Percentile graph

graphically in Figures 27 and 28, in which the data of these tables are turned into percentile graphs.

The very considerable amount of overlapping for the intermediate

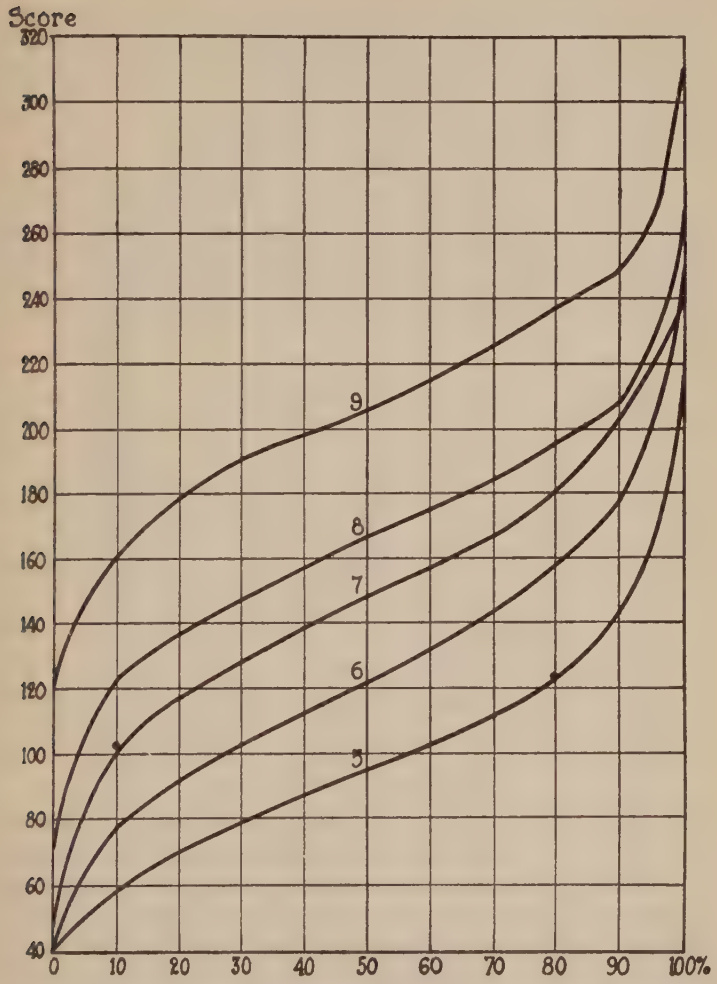

Figure 28.—Intelligence Examination, Delta 2, and Reading Examination, Sigma 3, Form B. One-teacher elementary schools, Grades 5–8, and small high schools, Grade 9. Percentile graph

and upper grades is even on these combined scores shown in Table 39. It may not be inferred that the total overlapping shown in this table is improvable classification except in so far as these two tests are complete measures of ability to do the work of these grades. As repeatedly noted already, there are other factors to be considered. It is, however, clear beyond question that the abilities represented by these scores are exceedingly important matters and that the amount of overlapping here shown is an objective fact of serious import for the instructional problems in these schools.

TABLE 39.—INTELLIGENCE EXAMINATION, DELTA 2, AND READING EXAMINATION, SIGMA 3. COMBINED SCORES. OVERLAPPING OF GRADES. ONE- AND FOUR-TEACHER ELEMENTARY SCHOOLS. GRADES 5 TO 8. SMALL AND LARGE HIGH SCHOOLS, GRADE 9. PERCENTAGE OF PUPILS IN EACH GRADE ABOVE THE MEDIAN OF GRADE NEXT ABOVE, AND PERCENTAGE OF PUPILS IN EACH GRADE BELOW MEDIAN OF GRADE NEXT BELOW

Overlapping in percentages		Grades				Averages
		5–6	6–7	7–8	8–9	
One-room school	Upward	20.8	26.2	29.5	8.6	21.7
	Downward	22.0	23.6	31.1	12.2	23.0
Four-room school	Upward	25.4	24.0	29.3	24.2	25.5
	Downward	23.9	23.9	30.2	25.2	25.7
One-room	Totals	42.8	49.8	60.6	20.8	..
Four-room	Totals	49.3	47.9	59.5	49.4	..

AN INDIVIDUAL SCHOOL

The data so far given do not necessarily represent any particular school. They are combinations for all the pupils tested in certain school districts. In the several schools these pupils are grouped into separate classes, rarely, if ever, exceeding 40 pupils in any group. It is possible that in these smaller groups there is less overlapping and it will, therefore, be desirable to examine an individual school with this in mind. In Tables 40–42 are given the distributions for the several grades in one school for the Delta 2 scores, the Sigma 3

scores and for the two combined, and in Table 43 is shown the overlapping in terms comparable with that for the whole state given in Table 39.

TABLE 40.—INTELLIGENCE EXAMINATION, DELTA 2: DISTRIBUTION AND MEDIAN SCORES FOR ALL PUPILS IN GRADES 4 TO 8 INCLUSIVE IN ONE SCHOOL (RYE, NUMBER 1)

Scores	Grades					Total
	4	5	6	7	8	
1–5	..	..	..	..	..	..
6–10	..	..	..	..	..	..
11–15	..	..	..	..	..	..
16–20	..	..	..	..	..	..
21–25	..	..	..	..	..	..
26–30	1	..	..	..	..	1
31–35	1	1	..	..	..	2
36–40	2	2	..	..	..	4
41–45	2	..	..	..	..	2
46–50	7	1	..	..	..	8
51–55	3	1	..	..	..	4
56–60	5	2	..	..	..	7
61–65	5	4	..	..	..	9
66–70	**6**	2	2	..	..	10
71–75	5	7	1	..	..	13
76–80	4	5	2	..	..	11
81–85	6	**5**	1	..	..	12
86–90	5	6	2	3	1	17
91–95	7	8	6	2	..	23
96–100	1	7	**6**	7	1	22
101–105	1	1	4	5	1	12
106–110	..	5	2	**4**	1	12
111–115	..	4	5	3	5	17
116–120	2	..	4	4	7	17
121–125	..	..	1	4	7	12
126–130	..	..	2	2	**7**	11
131–135	..	..	..	2	6	8
136–140	..	..	..	..	5	5
141–145	..	..	..	1	5	6
146–150	..	..	..	..	1	1
151–155	..	..	..	..	1	1
Total	63	61	38	37	48	247
Median score	69.6	85.4	99.1	106.9	126.0	96.0

Even here, however, in a school, which may rightly be regarded as above the average of those examined in New York state, there is the

TABLE 41.—READING EXAMINATION, SIGMA 3, FORM B: DISTRIBUTION AND MEDIAN SCORES FOR ALL PUPILS IN GRADES 5 TO 8 INCLUSIVE IN ONE SCHOOL (RYE, NUMBER 1)

Scores	Grades				Total
	5	6	7	8	
1–5	..	..	..	..	..
6–10	1	..	..	..	1
11–15	4	..	..	..	4
16–20	2	1	..	..	3
21–25	2	1	..	..	3
26–30	7	3	..	..	10
31–35	4	3	1	..	8
36–40	5	2	3	..	10
41–45	9	1	3	..	13
46–50	4	4	1	..	9
51–55	7	3	1	..	11
56–60	1	4	..	..	5
61–65	1	5	2	3	11
66–70	3	1	4	3	11
71–75	6	2	6	1	15
76–80	2	2	3	2	9
81–85	..	2	3	3	8
86–90	..	1	3	6	10
91–95	..	3	2	10	15
96–100	..	..	1	5	6
101–105	..	..	2	3	5
106–110	..	..	1	5	6
111–115	..	..	..	1	1
116–120	..	..	1	4	5
121–125	..	..	..	1	1
126–130	..	..	..	1	1
131–135	..	..	..	..	..
Total.....	58	38	37	48	181
Median score...	42.2	57.2	73.9	94	67.1

same evidence of overlapping abilities to do school work. The amount of overlapping is less when measured by the combined scores, but it is still very great.

It would seem that the situation is in part improvable by a single school administrator who has under his control all the factors contributing to the proper classification of pupils within a single school

TABLE 42.—INTELLIGENCE EXAMINATION, DELTA 2, AND READING EXAMINATION, SIGMA 3, FORM B: DISTRIBUTION AND MEDIAN SCORES FOR TWO TESTS COMBINED FOR ALL PUPILS IN GRADES 5 TO 8 INCLUSIVE FOR ONE SCHOOL (RYE, NUMBER 1)

Scores	Grades			
	5	6	7	8
41–50	1	..	..	..
51–60	2	..	..	..
61–70	1	..	..	..
71–80	2	..	..	..
81–90	3	1	..	..
91–100	3	1	..	..
101–110	6	1	..	..
111–120	11	4	..	1
121–130	4	2	2	..
131–140	8	2	2	..
141–150	4	4	1	1
151–160	3	4	3	..
161–170	3	7	3	1
171–180	2	3	6	3
181–190	5	2	5	5
191–200	1	1	6	1
201–210	..	2	1	6
211–220	..	3	1	6
221–230	..	1	4	8
231–240	..	..	..	5
241–250	..	..	2	3
251–260	..	..	..	4
261–270	..	..	..	3
271–280	..	..	..	1
Total.....	59	38	36	48
Median score.....	121	161	182	221

district. Individual teachers and superintendents may solve the problem in part. It remains true, even though individual teachers and superintendents do secure improved conditions in individual

schools or in small school districts, that a state-wide survey would reveal the same wide range of abilities within similarly designated grades owing to the variability of standards from school to school and from district to district. These considerations raise questions of school organization over wide territorial districts, such as city, county and state.

TABLE 43.—PERCENT OF OVERLAPPING OF GRADES IN ONE SCHOOL (RYE, NUMBER 1). INTELLIGENCE EXAMINATION, DELTA 2; READING EXAMINATION, SIGMA 3. INTELLIGENCE EXAMINATION, DELTA 2, PLUS READING EXAMINATION, SIGMA 3

Grades.....		4–5	5–6	6–7	7–8	Average
Delta 2	Downward	20	16	30	6	17
	Upward	25	18	36	14	23
	Total	45	34	66	20	40
Sigma 3	Downward	..	26	24	13	20
	Upward	..	22	24	17	21
	Total	..	48	48	30	41
Delta 2 and Sigma 3	Downward	..	18	13	10	13.6
	Upward	..	20	21	8	16.3
	Total	..	38	34	18	29.9

CHAPTER VI

SCHOOL PROGRESS

THE implications of these tests for purposes of school classification are closely connected with the problem of school progress. As bearing upon this problem it will be interesting to consider the mental-age-grade tables printed herewith (Tables 44–44c). The ages in these tables are based upon the scores made by more than 7000 pupils in elementary and high schools. The "mental age" of each child is determined by the table of age norms shown on page 90. The first column should read: "There were in grades three, 21 pupils of the chronological age of 7 years, *i. e.*, having passed their seventh but not their eighth birthday, and 42 pupils of the mental age of 7, and in grade four, one pupil of chronological age of 7 and 31 of the mental age of 7, etc. Of the chronological age of 8 years there were 142 pupils in grade 3, etc.," to the bottom of the table. The bottom of the table should be read: "Of 412 children in grade 3, the median chronological age is 9.2 years, with an average deviation of .9 year, and the median mental age is 8.8 with an average deviation of .6 year," etc.

Progress in Mental and Chronological Ages

The first important fact to be observed in Table 44 is the progress in mental age recorded from grade to grade. Except for the interval from grades 7 to 8, the step-up exceeds a year. The successive intervals in terms of mental years are as follows: 1.1, 1.4, 1.4, 1.3, .8. The total mental-age progress from grade 3 to grade 8 is 6 years. The intervals of chronological age for the group are as follows: 1.3, 1.1, .9, 1, .9, with a total chronological-age progress of 5.2 years. Superficially, these comparative figures might indicate that, while pupils were making a progress of 5.2 years in chronological age, they were making a mental-age progress of 6 years. The more plausible explanation is that the upper grades hold a smaller proportion of

dull children, so that the greater apparent increase in mental age is really an effect of elimination. This interpretation is supported by the smaller increase in both mental and chronological age from grade 7 to grade 8.

TABLE 44.—INTELLIGENCE EXAMINATION, DELTA 2: FOUR-TEACHER ELEMENTARY SCHOOLS. GRADES 3–8. AGE-GRADE DISTRIBUTION IN TERMS OF CHRONOLOGICAL AND MENTAL AGES. MEDIANS AND AVERAGE DEVIATIONS GIVEN FOR BOTH CHRONOLOGICAL AND MENTAL AGES IN EACH GRADE

Years	Grades											
	3		4		5		6		7		8	
	C.A.	M.A.	C.A.	M.A.	C.A.	M.A.	C.A.	M.A.	C.A.	M.A.	C.A.	M.A.
7	21	42	1	31	..	7	..	..	..	..	..	..
8	142	**190**	13	142	1	59	..	16	..	3	..	..
9	**140**	104	235	**204**	27	105	..	35	..	8	..	2
10	64	45	**195**	154	170	110	29	74	5	23	..	3
11	24	20	145	90	**207**	**136**	190	108	24	57	..	16
12	14	9	70	70	122	110	**233**	**162**	166	88	43	51
13	6	2	47	29	78	78	135	127	**170**	113	138	94
14	..	..	17	6	46	42	85	101	139	**126**	**208**	**125**
15	1	..	4	2	17	12	32	46	70	77	112	97
16	..	..	1	..	1	6	8	23	12	50	47	70
17	..	..	..	..	..	4	1	11	1	21	14	38
18	..	..	..	..	..	..	..	5	..	9	4	30
19	..	..	..	..	..	..	..	5	..	6	..	15
20	..	..	..	..	..	..	..	..	..	6	..	25
Totals	412	412	728	728	669	669	713	713	587	587	566	566
Median	9.2	8.8	10.5	9.9	11.6	11.3	12.5	12.7	13.5	14	14.4	14.8
Average deviation	.9	.8	1.0	1.2	1.0	1.5	.9	1.5	.9	1.6	.8	1.7

Passing to Table 44a, which gives the mental-age-grade distribution for one-teacher schools, it will be seen that the progress from grade to grade is less than for four-teacher schools. The figures for the several intervals are .8, 1.4, 1.4, 1 and .7, or a total of 5.3 years

from grade 3 to grade 8, which is .7 year less than for four-teacher schools. As compared with the increase in chronological age the mental age increase here, as in the case of four-teacher schools, is greater. The figures for the grade intervals are .9, 1.4, .9, .6, .9, or

TABLE 44A.—INTELLIGENCE EXAMINATION, DELTA 2. ONE-TEACHER ELEMENTARY SCHOOLS. GRADES 3–8. AGE-GRADE DISTRIBUTION IN TERMS OF CHRONOLOGICAL AND MENTAL AGES. MEDIANS AND AVERAGE DEVIATION GIVEN FOR BOTH CHRONOLOGICAL AND MENTAL AGES IN EACH GRADE

Years	Grade											
	3		4		5		6		7		8	
	C.A.	M.A.	C.A.	M.A.	C.A.	M.A.	C.A.	M.A.	C.A.	M.A.	C.A.	M.A.
6	3	..	..	..	..	..	..	..	..	..	..	..
7	20	158	2	52	..	7	..	..	..	..	..	..
8	120	**207**	40	193	2	52	1	18	..	4	..	..
9	**131**	61	131	**145**	34	110	2	44	..	9	..	1
10	99	13	**156**	81	85	**112**	30	85	4	30	1	7
11	35	6	103	41	**119**	99	106	**102**	25	37	10	20
12	18	1	53	13	115	48	**159**	101	74	**69**	27	72
13	15	..	24	..	50	19	86	68	**91**	61	75	**78**
14	4	..	11	1	36	10	65	42	64	40	**106**	63
15	1	..	4	..	15	3	29	12	28	23	60	37
16	..	..	2	..	2	..	2	5	2	11	18	13
17	..	..	..	..	1	..	..	3	1	5	5	6
18	..	..	..	..	1	..	..	..	1	..	..	4
19	..	..	..	..	..	..	..	..	..	..	..	1
20	..	..	..	..	..	..	..	..	..	1	..	..
Totals	446	446	526	526	460	460	480	480	290	290	302	302
Median	9.6	8.3	10.5	9.1	11.9	10.5	12.8	11.9	13.4	12.9	14.3	13.6
Average deviation	1.0	.6	1.0	.97	1.2	1.1	1.0	1.4	.9	1.5	.9	1.1

a total of 4.7 chronological years. The most plausible explanation for the discrepancy is again the elimination of the duller pupils.

A comparison of the median chronological and mental ages of the two types of schools shows the larger schools to have a distinct

advantage. The medians for the several grades arranged for easy comparison appear as follows:

	Grades											
	3		4		5		6		7		8	
	C.A.	M.A.	C.A.	M.A.	C.A.	M.A.	C.A.	M.A.	C.A.	M.A.	C.A.	M.A.
Medians { Large school.	9.2	8.8	10.5	9.9	11.6	11.3	12.5	12 7	13.5	14	14.4	14.8
Medians { Small school.	9.6	8.3	10.5	9.1	11.9	10.5	12.8	11.9	13.4	12.9	14.3	13.6
Differences in medians..	.4	.5	0	.8	.3	.8	.3	.8	.1	1.1	.1	1.2

TABLE 44B.—INTELLIGENCE EXAMINATION, DELTA 2: FOUR OR MORE TEACHER HIGH SCHOOLS. GRADES 9–12. AGE-GRADE DISTRIBUTION IN TERMS OF CHRONOLOGICAL AND MENTAL AGES. MEDIAN AND AVERAGE DEVIATION GIVEN FOR BOTH CHRONOLOGICAL AND MENTAL AGES IN EACH GRADE

Years	Grade							
	9		10		11		12	
	C.A.	M.A.	C.A.	M.A.	C.A.	M.A.	C.A.	M.A.
10	..	1	..	..	..	..	..	..
11	2	6	..	..	..	1	..	..
12	15	15	..	3	..	1	..	1
13	52	38	2	7	..	3	..	5
14	142	65	27	26	2	9	..	4
15	**121**	**102**	68	42	15	10	..	9
16	78	69	**86**	36	48	28	19	13
17	30	59	41	**43**	**53**	**29**	**58**	28
18	9	52	26	35	20	24	43	**22**
19	2	26	4	22	5	22	12	24
20	..	16	..	40	-2	19	11	38
21	..	..	..	..	1	..	1	..
Total.....	451	449	254	254	146	146	144	144
Median.....	15.1	15.9	16.3	17.3	17.1	17.7	17.9	18.5
Average deviation	1.1	1.7	.9	1.7	.9	1.5	.9	1.6

The advantage of the larger schools is never less than a half-mental-year and rises to 1.2 years in grade 8.

The selective character of the high school is indicated by the median scores in Tables 44b and 44c. The lowest ninth grade median is 15.6 mental years, .8 year above the median mental age of the

TABLE 44c.—INTELLIGENCE EXAMINATION, DELTA 2: FEWER THAN FOUR-TEACHER HIGH SCHOOLS. GRADES 9–12. AGE-GRADE DISTRIBUTION IN TERMS OF CHRONOLOGICAL AND MENTAL AGES. MEDIAN AND AVERAGE DEVIATION GIVEN FOR BOTH CHRONOLOGICAL AND MENTAL AGES IN EACH GRADE

Years	Grade							
	9		10		11		12	
	C.A.	M.A.	C.A.	M.A.	C.A.	M.A.	C.A.	M.A.
11	1	3	..	1	..	..	..	..
12	3	7	..	1	..	..	..	..
13	20	18	3	3	1	3	..	1
14	44	33	11	10	1	1	..	1
15	**62**	**49**	**34**	21	5	6	2	3
16	33	33	22	**20**	17	14	7	6
17	16	23	13	15	**20**	**12**	11	**11**
18	5	14	7	7	10	12	**11**	9
19	2	5	4	8	5	7	7	3
20	..	1	..	9	..	5	2	7
21	..	..	1	..	1	..	1	..
Total	186	186	95	95	60	60	41	41
Median	15.4	15.6	15.9	16.5	17.3	17.5	18.	17.8
Average deviation	1.0	1.3	1.1	1.5	1.0	1.4	1.1	1.3

better eighth grade group. For the larger high schools it is 15.9, or 1.1 years above the better eighth grade. The difference in chronological age between the same groups is .7 year. The larger high schools prune the freshman class, as is evidenced by the step-up of

1.4 years from grade 9 to grade 10, and continue the process through succeeding grades, reaching a median mental score of 18.5 years in grade 12, with a median chronological age of 17.9 years, a total increase of 2.6 years in mental age and 2.8 years in chronological age. The smaller high schools do not reach this level, showing an increase of but 2.2 mental years from the lower freshman score of 15.6 years to a twelfth grade median of 17.8 years.

Spread of Mental and Chronological Ages

A second observation to be made on these age-grade data pertains to the range in ages as expressed in the average deviations. (See Table 44.) In grade 3 the deviation in chronological age, .9 years, is greater than that in mental age, .6 years. This relation is reversed in grade 4 and in every higher grade, reaching the maximum difference in grade 8. This wider range in mental age in grade 8 is an evidence that the school classification gives greater play to chronological age than to differential mental ability. The higher grades have dragged along through lock-step promotion schemes the duller pupils, crediting "years spent" more highly than mental growth. Thus the eighth grade has no pupils under a chronological age of 12 years, but it has 21 pupils with a lower mental age. At the same time the mental capacities of the brighter pupils stretch out beyond their years, but the lock-step holds them back. The eighth grade has but 65 pupils beyond a chronological age of fifteen years, but it has 178 pupils who exceed a mental age of fifteen years.

In the case of the one-teacher schools the differences in range of chronological age and mental age are not so unequal, but here also the pupils in every grade but the third are more unlike in mental capacities than they are in actual years.

Retardation of Superior Students

The matter of school progress may be further considered in connection with the age-score tables given on pages 135–136, where the Delta 2 scores are given for all pupils by ages. Similar tables were given for the Sigma 3 results in Chapter III. Not all ages are adequately represented in these tables, due to the selective character of the school program, which keeps certain pupils more than a year

to a grade and allows many to drop out as they grow older. The twelve-year-olds, however, are mostly in school and it is fair to assume that we have for this age a fairly unselected group of such pupils in the districts tested.

TABLE 45.—INTELLIGENCE EXAMINATION, DELTA 2: FOUR-TEACHER ELEMENTARY SCHOOLS AND ALL HIGH SCHOOLS. GRADES 3–12. DISTRIBUTION OF SCORES BY AGES. MEDIAN SCORE FOR EACH AGE

	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	Total
0	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
1–5	2	..	..	2	1	..	4	..	..	..	..	..	..	..	..	9
6–10	..	1	3	4	2	1	..	..	..	..	..	..	..	..	..	11
11–15	1	4	1	8	3	4	2	1	..	..	..	..	..	..	..	24
16–20	..	9	6	11	13	3	1	2	..	..	..	..	..	..	..	45
21–25	1	12	17	12	5	9	10	3	..	..	..	..	..	..	..	69
26–30	3	18	18	12	23	8	3	5	..	..	..	..	..	..	..	90
31–35	1	13	24	19	13	18	10	4	2	1	..	..	..	..	..	105
36–40	1	20	27	18	17	11	10	4	3	..	..	..	..	..	..	111
41–45	6	11	27	25	27	11	10	9	3	..	..	..	..	..	..	129
46–50	3	13	32	26	28	20	15	5	2	2	..	..	..	..	..	146
51–55	2	13	36	25	28	22	11	9	4	..	..	..	..	..	..	150
56–60	..	5	28	32	18	20	22	13	8	..	..	..	..	..	..	146
61–65	..	11	31	27	34	26	19	12	5	1	..	..	..	..	..	166
66–70	2	10	32	33	34	26	26	18	7	4	..	..	..	..	..	192
71–75	..	7	19	35	34	36	20	18	12	4	..	..	..	..	..	185
76–80	..	1	22	29	29	32	17	28	8	4	3	..	..	..	..	173
81–85	..	3	18	22	41	46	30	16	13	6	1	1	..	..	..	197
86–90	..	3	18	26	33	30	31	30	19	8	6	..	..	..	..	204
91–95	..	1	17	31	42	27	51	30	16	12	1	2	1	1	..	232
96–100	..	1	14	16	28	33	36	39	29	18	6	3	3	..	2	228
101–105	..	..	2	14	42	38	28	37	34	20	6	5	1	..	..	227
106–110	..	..	5	6	25	44	39	56	28	19	11	13	1	1	..	248
111–115	..	..	3	12	17	46	47	47	33	22	13	5	2	..	1	248
116–120	..	..	2	7	15	38	30	61	36	25	21	10	1	..	..	246
121–125	..	..	..	4	9	29	46	60	29	34	17	8	10	3	..	249
126–130	..	..	..	2	17	30	41	42	32	35	26	15	7	..	..	247
131–135	..	..	..	3	10	16	29	48	45	40	26	19	3	2	..	241
136–140	..	..	..	..	2	16	31	39	34	24	29	17	6	5	..	203
141–145	..	..	..	1	1	7	25	31	30	23	28	14	4	2	2	168
146–150	..	..	..	..	2	5	12	19	22	24	29	12	5	1	1	132
151–155	..	..	..	..	..	4	4	13	18	17	8	6	3	..	..	73
156–160	..	..	..	..	..	..	2	7	8	7	16	5	..	..	..	45
161–165	..	..	..	..	..	..	..	3	6	2	7	2	..	..	..	20
166–170	..	..	..	..	..	..	..	..	2	2	3	..	..	..	..	7
171–175	..	..	..	..	..	..	..	..	..	1	1	..	..	..	..	2
Total	22	156	402	462	593	656	662	709	488	355	258	137	47	15	6	4968
Median	42.5	41.4	57.8	67.5	78.8	92.0	101.5	112.7	118.5	125.6	134.5	132.7	129.5	136.5	..	98.2

A study of the data in Table 45 shows that 25 percent of the twelve-year-olds in larger schools score as high as the median child of grade 8. An examination of the distribution of twelve-year-olds throughout these schools shows that only 10 percent are to be found in the eighth grade. There are 15 percent of the twelve-year-olds,

therefore, who have the median ability of grade 8 but who are in the lower grades. (See Table 46.) Even though they are grouped in these lower grades, many of them are doing superior school work, achieving results distinctly above the achievement of the grades

TABLE 45A.—INTELLIGENCE EXAMINATION, DELTA 2: ONE-TEACHER SCHOOLS. GRADES 3–8. DISTRIBUTION OF SCORES BY AGES. MEDIAN SCORE FOR EACH AGE

	Ages													Totals
	6	7	8	9	10	11	12	13	14	15	16	17	18	
0	..	1	..	2	..	..	..	..	2	..	..	..	..	5
1–5	..	2	5	6	8	..	..	2	..	..	..	..	..	23
6–10	..	2	7	13	9	6	2	1	..	..	..	..	..	40
11–15	..	3	14	21	25	8	4	4	1	..	..	..	..	80
16–20	1	3	17	23	15	13	4	4	3	1	1	..	1	86
21–25	..	4	23	23	22	11	9	3	3	2	..	..	..	100
26–30	..	2	23	32	22	21	11	4	4	2	..	..	..	121
31–35	..	..	15	19	25	11	13	5	3	2	..	..	..	93
36–40	1	..	14	28	21	23	13	14	7	6	..	..	..	127
41–45	1	2	13	21	27	21	16	10	3	3	1	..	..	118
46–50	..	2	8	18	27	17	15	5	10	5	1	1	..	109
51–55	..	..	6	18	27	19	28	14	9	1	1	1	..	124
56–60	..	1	7	14	26	24	26	9	9	3	..	1	..	120
61–65	..	..	2	19	32	27	29	21	13	10	..	..	1	154
66–70	..	..	2	8	14	21	28	25	19	9	2	1	..	129
71–75	..	..	1	10	16	22	31	16	14	5	1	..	..	116
76–80	..	..	2	11	12	31	37	15	15	5	2	1	..	131
81–85	..	..	1	2	11	31	27	23	25	10	1	..	..	131
86–90	..	..	1	5	11	22	28	23	19	14	3	..	..	126
91–95	..	..	1	1	9	31	33	25	30	9	1	1	..	141
96–100	..	..	..	..	5	19	26	21	20	16	3	..	..	110
101–105	..	..	..	1	3	18	24	17	21	9	2	..	..	95
106–110	..	..	..	2	4	19	16	26	15	7	1	1	..	91
111–115	..	..	..	1	1	10	6	17	4	4	1	1	..	45
116–120	..	..	..	..	1	9	7	14	10	6	1	..	..	48
121–125	..	..	..	..	1	2	5	11	9	4	1	..	..	33
126–130	..	..	..	..	1	6	3	4	4	1	3	1	..	23
131–135	..	..	..	..	..	5	4	5	2	1	..	..	..	17
136–140	..	..	..	..	..	..	1	2	2	..	..	..	..	5
141–145	..	..	..	..	..	..	..	..	..	1	..	..	..	1
146–150	..	..	..	..	..	..	..	..	..	..	..	..	..	..
151–155	..	..	..	..	..	..	..	..	..	..	..	..	..	..
156–160	..	..	..	..	..	..	..	..	..	..	..	..	..	..
161–165	..	..	..	..	..	..	..	..	..	1	..	..	..	1
166–170	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Total....	3	22	162	298	375	447	446	340	276	137	26	9	2	2543
Median...	..	21	29.2	37.78	48.5	71.3	75.1	84.9	85.75	87.6	88.75	78.5	..	65.0

in which they are found and equal to the average of eighth grades in most schools. Thus, a twelve-year-old girl in grade 5 scores a total of 125 points in four achievement tests, a record which is equaled by only 15 percent of the eighth grade pupils in Erie County. Another

fifth grade child scores 124 in the same group of tests. Similar cases could be cited at length. There are some cases where the achievement scores are too low to be comparable with the record made in the intelligence tests, and it is a serious educational question whether or not these high scoring pupils would not be doing a higher grade of school work were they classified with pupils of better achievement.

In the case of the larger schools 32 percent of the twelve-year-olds are in grade 7 and above, whereas the scores of twelve-year-olds require just 32 percent to be in grade 7. From these figures it would appear that the schools are sensitive to superior ability on the part of pupils to some degree since they allow this large group to make better than normal progress. This 32 percent who are in grade 7 contain some pupils of the highest ability whose intelligence scores would allow them to be in grade 8 or above. Were these most gifted pupils so far advanced the percentage in grade 7 would fall to less than 20 percent. It is apparent, therefore, that the actual acceleration even to grade 7 is less than might be possible under the best conditions.

Could we be certain that these pupils who achieve the high intelligence ratings also possess the character traits, physical fitness, and essential emotional attitudes comparable to their general mental alertness, it would follow that the schools permit a measureable retardation of its most gifted pupils. The apparent educational loss sustained by this retardation—one year or more for 15 percent of the most intellectual pupils in school—if actually existent, is a very serious matter both for the pupils concerned and for society in general. The insufficiency of our data does not enable us to make so definite a generalization, and to have secured such detailed information concerning individual pupils would have exceeded the scope of a state-wide survey. Our figures are, however, sufficient to define a problem to which every teacher, supervisor and administrative officer should give study.

Items in Further Diagnosis

The method of such study is two-fold: First, any pupil suspected of possessing more than average intellectual capacity should have a

most careful diagnosis. Such a diagnosis cannot be made with a single intelligence test, however reliable such a test may be. Repeated tests should be given until there can remain no reasonable doubt as to the existence of superior intellectual talent. Such tests should be supplemented by the most adequate possible analysis of character traits and emotional attitudes and interests, the success of the child at practical tasks in school and out, his range of experience, previous schooling, etc. Only upon such a comprehensive basis can a diagnosis of genuine superiority be based.

The second item in a study of the situation is the constructive school and life program desirable for such a pupil. We have as yet had but little satisfactory experience in planning and carrying through a school program for the education of gifted children. What such a program should be we have for the most part yet to learn. Its tremendous importance is a genuine challenge to the best thought which any school officer can give to it.

Lest the trend of this discussion be misunderstood as an argument for the indiscriminate acceleration of gifted pupils in school or even for their segregation, it may be pointed out that there are cogent arguments for keeping such pupils with the less gifted in the regular classes, giving supplementary educational opportunities on the side. Whether such arguments are conclusive only extended experimental results, not now available, can prove. A general program of acceleration is certainly preferable to the kind of indifference which allows gifted pupils to grow up without the intellectual stimulation which challenges their best powers, or without the educational program that develops in them the essential habits of study, industry and supreme effort at intellectual tasks.

Unwarranted Acceleration

A situation somewhat less serious than that concerning gifted pupils but still important may be noted by an examination of the twelve-year-olds at the low end of the scale. In terms of the test, 18 percent of these pupils score as low or lower than the median child of grade 4. The records show that only 13 percent are so low as this in actual grade placement. Eight percent score as low as the median pupil of grade 3, but only 3 percent are in this grade. It is

not desired to lay too much stress upon the injustice of advancing these low-scoring pupils. A certain proportion of them make up by industry, perseverance and other character traits for a certain amount of mental backwardness and are entitled to promotion.

It may also be that some of these pupils of inferior intelligence have profited by superior home conditions and superior previous schooling so that their achievement is genuinely in excess of that which pupils of their ability generally make. Nothing that we know about school progress, however, would justify such a conclusion in behalf of the entire group. Even if we take the particular individual pupils who make these low scores, we find that in most cases the achievement test scores are low even though the pupil is in a higher grade. Thus, there are a large number of these cases in grade five. Rarely, however, do these pupils achieve the normal score in reading, spelling or arithmetic. A typical case reads like this: reading 23, spelling 5, addition 12, multiplication 8, or like this: reading 12, spelling 3, addition 10, multiplication 8. Such pupils do not belong to grade five.

While it thus appears that a number of the low scoring pupils are accelerated beyond the possibility of any genuine profit from the work of the grades in which they are found, it does not follow that a longer stay in the routine work of the previous grades would have been valuable. What most of them deserve is a differentiated curriculum designed to give them the kind of training by which they can really profit, and superior teaching in the most fundamental items of silent reading and arithmetic.

The One-Teacher Schools

The analysis of the age scores in terms of school progress could be extended to one-teacher schools. On the face of the figures the disparity in percentages for pupils entitled to grade ranking and for those actually in grade is less than appears in the case of the larger schools. In the one-room schools 8 percent make the necessary score and 5.5 percent are so far advanced. The figures are complicated by the elimination of pupils in the upper ages so that any such direct comparison is invalid. Nothing in the figures justifies the belief that the larger schools are any less efficient in this regard.

While the pupils of other ages are probably a more selected group than are the twelve-year-olds, a study of their scores leads to the same general conclusion. For ages ten, eleven, and thirteen the facts are easily apparent. There are a greater number of the pupils whose ability as represented in the scores of the test entitles them to advanced standing than are to be found in the upper grades and there are more of the low-scoring pupils advanced beyond their capacities to do the school work than are justified by their school achievements.

TABLE 46.—INTELLIGENCE EXAMINATION, DELTA 2: SHOWING GRADE PROGRESS OF TWELVE-YEAR-OLDS IN TERMS OF MENTAL ABILITY

	One-teacher schools		Four-teacher schools	
	Reaching medians of		Reaching medians of	
	Grade 7	Grade 8	Grade 7	Grade 8
Number entitled to grade	47	34	212	167
Percent	10	8	32	25
Percent actually in grade	23	5.7	32	10

From all these figures it appears that the effect of the school program is to keep the pupils of any age within a narrower range of grade distribution than is warranted by their intellectual abilities. The group methods of instruction, the yearly units of curricular organization, and the scheme of annual and semi-annual promotions are apparently not sufficiently flexible to allow the freest play of mental powers. A somewhat more generous program is needed.

MILLER AGE SCORES

The scores in the Miller tests are also given by ages in Tables 47–48. Owing to the fact that these scores are for high school pupils only, there is a much greater selection of cases than was true of the Delta 2 scores. The tables reveal, however, certain very interesting

facts. The median score for the entire group is 74 and the median score for each age group represented in this table is approximately the same score. The 47 thirteen-year-olds score 74 and the 28 nineteen-year-olds score 74; the intermediate ages do almost exactly

TABLE 47.—MILLER MENTAL ABILITY TEST. LARGE HIGH SCHOOLS. GRADES 9–12. DISTRIBUTION OF SCORES BY AGES. MEDIAN SCORE FOR EACH AGE

	Ages											Total
	11	12	13	14	15	16	17	18	19	20	21	
0	..	..	..	..	..	..	..	..	..	..	..	..
1–5	..	..	..	..	..	..	..	..	..	..	..	..
6–10	..	..	..	..	..	..	..	..	..	..	..	..
11–15	..	..	..	..	..	..	..	1	1	..	..	2
16–20	..	..	..	..	..	..	2	1	..	..	..	3
21–25	..	..	..	..	..	1	1	..	1	..	..	3
26–30	..	..	..	2	4	2	2	1	..	..	..	11
31–35	..	..	..	1	2	4	2	1	1	..	..	11
36–40	..	2	..	2	8	5	2	4	..	..	..	23
41–45	..	..	2	4	7	9	3	7	..	1	..	33
46–50	..	1	1	3	12	12	5	7	1	..	..	42
51–55	..	1	..	9	17	19	12	4	2	..	..	64
56–60	..	1	5	15	19	18	21	4	3	1	..	87
61–65	..	..	3	17	20	19	11	5	2	3	1	81
66–70	..	**3**	7	21	33	16	10	8	2	2	1	103
71–75	1	..	**8**	**15**	**23**	**27**	22	**9**	**2**	3	..	110
76–80	..	1	3	20	29	33	**20**	14	..	**4**	..	124
81–85	..	1	5	20	30	25	22	11	4	2	..	120
86–90	..	2	6	11	28	19	15	5	4	1	..	91
91–95	1	..	5	14	9	14	14	11	3	..	..	71
96–100	..	..	2	4	13	12	21	3	2	1	..	58
101–105	..	..	..	3	6	7	7	1	..	1	..	25
106–110	..	..	..	2	..	3	2	1	..	1	..	9
111–115	..	..	..	1	..	1	1	..	..	..	..	3
Total	2	12	47	164	260	246	195	98	28	20	2	1,074
Median score	..	68	74	74	73	74	77	74	74	76	..	74.4

the same. This is just the score for grade 10, as may be seen in Table 35, page 116.

The ninth grade score (see Table 35) is 67 and the twelve-year-olds shown in Table 47 who have forged ahead and have had almost a

year in high school have a median of 68. They are clearly entitled to their advancement. Of the two eleven-year-olds in grade 9, one scores 73 and the other 92. The 47 thirteen-year-olds score the median of grade 10, although they are practically all in grade 9.

TABLE 48.—MILLER MENTAL ABILITY TEST. SMALL HIGH SCHOOLS. GRADES 9–12. DISTRIBUTION OF SCORES BY AGES. MEDIAN SCORE FOR EACH AGE

	Ages											Total
	11	12	13	14	15	16	17	18	19	20	21	
0	..	..	..	..	..	..	..	..	..	..	..	.
1–5	..	..	..	..	..	..	..	..	..	..	..	..
6–10	..	..	..	..	..	..	..	..	..	..	..	..
11–15	..	..	..	..	..	..	..	..	..	..	..	..
16–20	..	..	..	..	1	..	..	..	..	..	..	1
21–25	..	..	..	..	1	..	..	1	..	..	..	2
26–30	..	..	1	1	1	..	..	..	..	..	..	3
31–35	..	..	..	..	4	2	..	1	..	..	..	7
36–40	..	..	..	2	2	2	..	..	..	..	..	6
41–45	..	..	..	..	3	1	2	..	..	..	..	6
46–50	..	..	2	3	5	7	6	1	1	..	..	25
51–55	..	..	4	2	3	6	4	1	1	..	1	22
56–60	..	2	..	5	8	6	3	5	1	..	..	30
61–65	..	**2**	2	5	5	7	6	5	5	..	..	37
66–70	..	..	4	3	13	10	7	**4**	..	..	1	42
71–75	..	..	**4**	**7**	**12**	**4**	**8**	4	**2**	1	1	43
76–80	..	1	3	6	10	14	8	3	2	..	..	47
81–85	..	1	..	5	9	6	6	2	1	..	..	30
86–90	..	1	3	5	8	14	4	5	5	..	..	45
91–95	1	..	3	6	13	4	5	..	1	1	..	34
96–100	..	..	2	2	2	3	5	..	..	..	..	14
101–105	..	..	..	..	2	..	1	2	..	..	..	5
106–110	..	..	..	..	..	..	2	1	..	..	..	3
111–115	..	..	..	..	..	..	..	..	..	..	..	..
Total	1	7	28	52	102	86	67	35	19	2	3	402
Median score	..	65	72	74	73	74	74	70	75	..	..	73.3

It is clear from these figures that the pupils who have advanced faster than the school program provides have done so on the basis of genuine capacity to do the work. The discrepancy comes in their not advancing as fast as their abilities warrant.

The over-age pupils who are still in high school are obviously not superior students. In general they are of average or less than average ability and are making up by additional time for what they lack in native capacity.

Intelligence and Reading Combined

Attention has been repeatedly called to the margin of unreliability

Table 49.—Intelligence Examination, Delta 2, and Reading Examination, Sigma 3, Form B: Combined Scores. Four-Teacher Elementary Schools. Grades 5–9. Distribution of Scores by Ages. Median Score for Each Age Group

Score	8	9	10	11	12	13	14	15	16	17	18	19	Total
31–40	..	1	..	..	..	..	..	..	..	..	..	..	1
41–50	..	1	..	..	..	..	..	..	..	..	..	..	1
51–60	..	2	..	1	4	3	4	2	1	..	..	..	17
61–70	..	1	..	2	5	2	5	3	..	..	..	..	18
71–80	..	2	1	1	4	4	4	1	..	..	1	..	18
81–90	..	3	1	..	8	5	4	6	..	..	..	..	27
91–100	1	3	2	3	14	10	9	5	1	..	..	..	48
101–110	..	1	2	11	13	15	9	9	3	1	..	1	65
111–120	..	2	4	7	18	18	18	7	7	1	..	..	82
121–130	..	**2**	2	8	25	29	23	11	3	1	..	..	104
131–140	..	4	..	20	31	21	26	15	5	..	1	..	123
141–150	..	2	4	24	27	36	30	19	4	3	..	1	150
151–160	..	4	**3**	22	28	26	38	18	6	2	..	..	147
161–170	..	4	5	**24**	23	34	35	27	12	5	..	..	169
171–180	..	1	1	15	**35**	34	27	31	22	3	2	..	171
181–190	..	1	1	17	35	**35**	42	**28**	**9**	4	**3**	..	175
191–200	..	1	1	9	30	42	**47**	26	3	**1**	2	..	162
201–210	..	..	..	12	36	25	49	26	14	3	2	..	167
211–220	..	..	2	11	29	35	41	22	14	5	..	..	159
221–230	..	..	2	8	25	23	34	27	14	4	2	..	139
231–240	..	..	..	5	14	26	32	11	6	1	..	..	95
241–250	..	..	1	1	13	19	29	20	6	3	..	..	92
251–260	..	..	..	1	5	22	19	4	5	4	..	..	60
261–270	..	..	..	..	5	10	16	4	1	1	..	..	37
271–280	..	..	..	1	3	1	6	2	1	..	..	..	14
281–290	..	..	..	..	..	..	2	..	1	..	..	..	3
291–300	..	..	..	..	..	2	1	..	1	..	..	..	4
301–310	..	..	..	..	..	..	1	..	..	..	..	..	1
Total....	1	35	32	203	430	477	551	324	139	42	13	2	2,249
Median..	..	128.5	151	162.0	176	181.4	191.2	185.4	186.5	196	188.5	131	..

in the use of a single examination. Presumably the combination tables, such as Tables 49 and 50, which give the distributions in Delta

TABLE 50.—INTELLIGENCE EXAMINATION, DELTA 2, AND READING EXAMINATION, SIGMA 3, FORM B: COMBINED SCORES. ONE-TEACHER ELEMENTARY SCHOOLS. GRADES 5 TO 9. DISTRIBUTION OF SCORES BY AGES

Score	Ages										Total
	8	9	10	11	12	13	14	15	16	17	
41–50	..	1	6	9	6	3	7	6	..	..	38
51–60	..	2	2	10	6	5	6	4	..	..	35
61–70	..	3	9	10	18	7	10	2	1	..	60
71–80	..	4	13	19	22	12	8	8	1	..	87
81–90	..	3	13	18	26	24	17	5	..	..	106
91–100	1	6	12	32	32	13	7	9	..	1	113
101–110	1	**6**	**13**	22	38	23	21	6	..	1	131
111–120	..	1	10	**29**	34	19	19	5	1	1	119
121–130	..	2	7	14	**32**	31	21	10	3	..	120
131–140	..	3	10	18	26	**19**	19	11	2	..	108
141–150	..	2	7	15	27	23	**21**	18	4	..	117
151–160	..	1	3	17	26	22	20	**10**	6	**1**	106
161–170	..	..	8	12	23	26	16	13	4	..	102
171–180	..	1	1	5	16	16	17	13	3	1	73
181–190	..	..	..	8	9	17	15	9	3	1	62
191–200	..	1	1	5	4	16	24	7	**9**	1	68
201–210	..	..	1	7	10	15	17	10	5	..	65
211–220	..	..	1	3	4	4	7	8	5	..	32
221–230	..	..	..	3	5	6	6	6	2	1	29
231–240	..	..	..	2	3	5	11	7	2	..	30
241–250	..	..	..	..	1	2	6	4	2	..	15
251–260	..	..	..	1	..	2	..	5	..	..	8
261–270	..	..	..	..	..	..	1	..	1	..	2
271–280	..	..	..	..	..	1	..	1	2	..	4
281–290	..	..	..	..	..	..	..	..	..	..	..
291–300	..	..	..	..	..	..	..	..	..	..	..
301–310	..	..	..	..	..	..	..	1	1	..	2
311–320	..	..	..	..	..	..	..	..	..	..	..
Total	2	36	117	259	368	311	296	178	57	8	1,632
Median	96	101	103.7	114.2	121.6	140.2	147.2	156	191.4	156	..

2 and Sigma 3 combined for four- and one-room schools present a more dependable basis of generalization. An examination of these

tables, however, leads to no different conclusions. The amount of overlapping of age scores is apparently about the same and the number of cases entitled to advancement but not securing it is about the same.

It would be easy to push too far the exact interpretation of these tables. Any adjustment made on the basis of tests such as these must take into account much information concerning individual pupils not here available. About the general situation, however, there can be little doubt, namely, there is ample room for improvement of the school program so that pupils may advance more in accord with their capacities, and that, in a careful scrutiny of conditions, the use of tests such as these is a decided help.

CHAPTER VII

SCHOOL ORGANIZATION

THE New York rural school system is built upon the traditional plan of eight years to the elementary school and four years in the high school. There are some variations to this in the organization of junior high schools, intermediate schools, special classes and separate sections of the regular grades, but the 8-4 plan is, in general, the basis of rural school organization and administration. We have already attempted to throw some light upon the efficiency of this scheme of organization in the discussion of school progress and the classification of pupils. Let us next inquire to what degree the exact meaning of this organization is clear and dependable.

In our ordinary consideration of school progress a grade designation is the medium of exchange. Grade 8, for example, means for most schools the end of the elementary school course. To finish this grade in New York state means to have been enrolled in school 180 days per year for 8 years or a total of 1440 days; it means to be about 14.4 years of age, to have had extended training in reading, handwriting, spelling, language, arithmetic, grammar, geography and American history, and to be possessed of the requisite information and skill for entrance upon high school work. Upon the assumption that such a grade designation carries such a definite connotation, the whole school organization, state and local, is based. In these terms courses of study are laid out, educational privileges are granted, school moneys are raised and distributed, and educational discussion is carried on.

This assumption that a grade designation carries with it such a definite meaning is hardly justified by the conditions revealed by the tests. The assumption is that an eight-grade school should

give an eight-grade elementary education, but the test results show that grades with the same numerical designation have greatly different levels of accomplishment even within the same school district. These differences appear more definitely when types of schools are considered. Thus, there is a clear gap between the level of educational advancement represented by the eighth grade of the larger rural schools and the eighth grade of the one-teacher schools. To be the median eighth grade pupil in the larger rural schools of New York means to score 115 in the intelligence test, 81 in the reading examination, 76 in the combined history tests, 84 in spelling, 16.6 in addition and 16.8 in multiplication, whereas, to be the median eighth grade pupil in the one-teacher school means to make the following scores: intelligence 101, reading 66, history 60, spelling 74, addition 16.2, multiplication 16.9. The latter scores are more nearly comparable to seventh grade standing in the larger schools; only in age, years in school, course of study outlined, and achievements in arithmetic are the two "grades 8" alike. If we are to consider the conditions in the larger schools as a basis for comparison, there is a measurable illusion, amounting to a year or more, in speaking of the final year in the one-teacher schools as grade 8. Either this, or the eighth grades of the larger schools should be designated as grade nine.

Grade 8 is here used by way of illustration. Similar facts are revealed by the scores for any other grade. Thus, in grade 5 we have the following comparative scores:

	Delta 2	Sigma 3	Addition	Multiplication
Small school.....	65	32	13.4	12.5
Larger school.....	75	42	13.6	14.1

That such discrepancies from the one-teacher school to the larger school units are not peculiar to New York state is easy of demonstration, as may be observed in Chapter XIV, which summarizes data on this topic. The differences, however, are not confined to variations within state limits.

Dr. Miller found that the average score in intelligence examinations for beginning students in Minnesota high schools is 53 and for second year students 62. In the New York survey we found the median score in April for first year students to be 67 and for second year students 78, a difference between the Minnesota and New York groups of about a year. The median scores are given together with the median ages for the several high school grades for both the Minnesota results and the larger New York high schools in Table 51.

TABLE 51.—MILLER MENTAL ABILITY TEST; MINNESOTA AND NEW YORK MEDIAN SCORES WITH MEDIAN AGES FOR HIGH SCHOOL GRADES. MINNESOTA SEPTEMBER MEDIANS EXTENDED BY COMPUTATION TO APRIL RATINGS

	Grades							
	9		10		11		12	
	Median score	Median age	Median score	Median age	Median score	Median age	Median score	Median age
Minnesota	57.5	..	65	..	71.5	..	76	..
April ratings	..	15.4	..	16.3	..	17.2	..	18.2
New York April ratings	67	..	74	..	80	..	85	..
New York April ratings: large high schools	..	15.2	..	16.3	..	17.1	..	17.9

The ninth grade norm published by Miller was based largely on Minnesota schools. It shows, as may be easily observed in Figure 29, a lower mentality requirement than exists in New York schools. Although the ninth grades in the larger New York high schools exceed in scores the same grades in the smaller high schools, even these latter greatly exceed the norm thus fixed on the bases of results in another state. It cannot be here said whether the New York or the Minnesota standard is the better one. Too many issues are involved to say offhand whether a high or a low level of ability for ninth grade entrance is better.

For one thing the answer to such a problem involves our theories

as to the relation of our schools to a democratic society. What we can say clearly, however, is that the standards of the two states are different in terms of this test, although in both states we call the entering high school classes ninth grades. Upon the assumption that the ninth grade designations are of like meaning proceeds all our educational discussion and all school organization and administration.

It may be pointed out in this connection that school administrators can change the level of ninth grade ability by a process of general retardation. By holding pupils longer in the grades they may assure a higher intelligence level for ninth grade classes, because children so improve in ability by the mere act of living on from their fourteenth to their fifteenth birthdays, quite apart from any effect of formal schooling during the lapse of this year. The median age of the pupils must always, therefore, be included in a consideration of grade intelligence.

This difference in age hardly accounts for the difference in median test scores as between the New York and the Minnesota groups. The eleven hundred pupils for whom Miller reports a median score of 53 in September were 14.7 years old. The New York children in April were 15.1 and 15.4 years old in the two types of schools. The lapse of seven months from September to April would just about bring the Minnesota group up to the age level of the New York group.

Extending the Minnesota September ninth grade median up to what would be an April score places it at 57.5, which still falls short by a full year's growth the New York median of 67. In fact the Minnesota tenth grade median extended to April rating is only 65 points.

In a state-wide study of the intelligence of Indiana high school seniors, Book found that "in some schools the entire senior class made scores which placed them above the median for the entire state, while in other schools the entire senior class ranked below the state median." He notes further that "similar differences appear in schools of the same size and rank located in the same county or city."

For some time past in the Minneapolis public schools the Hag-

gerty intelligence examination, Delta 2, has been given to eighth grade pupils as a partial basis for classifying such students in high school. At one testing period there were 42 schools included. In one of these schools the median score for a group of 39 pupils was 105. This is the equivalent to the norm for 14-year-old children. In another school the median score was 126, which is the norm for sixteen-year-olds. Thus within the limits of the same school system there is a difference between two eighth grade classes of two years in mental development. The median score for all the elementary schools tributary to one high school was 112. It was 121 for those tributary to another high school. There is a difference of one mental year between the two, which is a definitely measurable error in applying the same grade designation to each group.

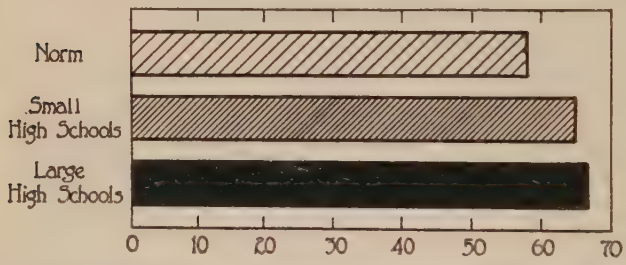

Figure 29.—Miller Mental Ability. Median scores for ninth grade, large and small high schools. Norm for ninth grade

Statistics to the same end can be quoted in extenso. The inescapable inference is that so long as schools are standardized on the basis of the years which children have been in school, there will be a measurable discrepancy in the meaning of standards as these are used to describe schools in different parts of a city, county and state, to say naught of the country as a whole.

It would add materially to clear thinking about the New York elementary school system if some educational agency could and would fix the meaning of a grade in terms of standard tests. This meaning should be stated in objective terms, such as the scores of well-standardized tests and scales. A standard fifth grade would be one in which the pupils scored such and such marks in definitely

designated tests. A standard eighth grade would show another definite set of scores in the same or other tests, and a standard elementary school would be one in which grade for grade definite objective standards in intelligence and achievement tests are met. Upon the condition of meeting these standards the rating of a school would be based, educational privileges granted, school moneys allotted, and the administration of the school carried on.

Basic Elements in Objective Standardization

The proposal to define the meaning of a grade or larger school unit in terms of objective measures must, of course, have detailed specification to be of any use. The task of such specification is the business of whatever standardizing agencies exist within the state, such as the State Department of Education, which is already engaged so extensively in the work of standardization. It may clarify the proposal, however, if a definition may be offered for a particular place in the system where standardization is much needed, namely, at high school entrance. What can be offered in the name of tests and measurements that will lend a more exact definition to the eighth or ninth school grades?

If such standardization is undertaken, what type of measures may be of service? First in the list of such examinations should be placed a measure of the general ability of pupils to do school work, measures of the type commonly designated as group intelligence tests, represented in this survey by the Delta 2 and the Miller examinations. As already indicated, abundant evidence is at hand to show that the ability to do school work is at least roughly correlated with ability to make scores in tests of this kind. A further fact of significance in this connection is that probably nowhere in our whole measurement program are we better provided with satisfactory measuring instruments than at this point of eight or ninth grade intelligence. There are more than a score of intelligence examinations usable at this point, which, while varying in details of results, will give substantially the same records for groups of thirty or more pupils. To be sure, much experimental work remains to be done in equating these tests with each other so that we may know what a score of 120 in the Haggerty Intelligence

Examination Delta 2 means in terms of the Miller, the Terman, the Otis, the Whipple or the National Examinations. The problem of so evaluating these tests involves nothing that we do not fairly well know in the realm of statistical methods and sets for us no unsolvable scientific problem. However extended and laborious may be the work of refining the measuring instruments there should be kept clearly in mind the fact that the fundamental item in defining standard levels of advancement is an objective statement of the requisite capacity for pursuing the educational program of a particular grade, and intelligence tests offer probably the most satisfactory means for giving such an objective statement.

The second item in a program of objective standards is a satisfactory measure of silent reading ability. By and large, the most fundamental prerequisite for pursuit of the high school course, aside from general mental development, is the capacity on the part of a pupil to read intelligently the language of the books used in that course. Students insufficiently prepared to extract information from books are handicapped for every advanced stage of formal schooling, and a certain definite achievement in this field should be demanded as a criterion for grade definition.

The third item to be placed in a program of standardization is a test of a pupil's ability to express his own thoughts in the English language. There will probably be less agreement upon the satisfactoriness of the present technic of language measurement than is true of either intelligence or reading measurement, but even so, there is good reason to believe that a sincere and thoroughgoing attempt to produce such a standard objective statement of conditions would meet with success.

It may appear that we are overlooking the more specific school subjects by thus making intelligence, reading skill and ability in written composition the basic elements in a criterion of standardization. The degree to which such specific subjects may be thus ignored is more or less relative to the stage of progress with which we are concerned, specific subject prerequisites becoming much more significant in certain places in grade advancement than in others. But for the end of the elementary school and the beginning of the high school, it would seem that the three things named above

should be made the fundamental bases of standardization, and tests in specific subject matter should be supplemental if used at all.

Objective Standards Not Necessarily Uniformity

If the state department of education or any other central school administrative unit should adopt a program of standardization of the type suggested above, it would not follow that all schools would become alike or that all children would be subjected to exactly the same treatment. The purpose of such standardization is to make the problems of administration intelligible, to bring about a situation where it can be known in terms of pupil achievement exactly what any grade designation means. Under circumstances of this type, everybody—teachers, administrators, supervisors, public citizens—would know whenever a particular eighth grade or any other grade was at variance from the state standards and would know it in terms most significant for the evaluation of school work.

If there exist in any school or in any school district reasons, good and sufficient, why that particular school or school district should not meet an objective standard so fixed, or why another school should exceed such standards, the necessary recognition should be given to these facts. The purpose of such standards is to clarify thinking on educational problems rather than to produce uniformity in school programs. For instance, it may be reasonable to expect, owing to certain conditions fundamentally determinative in character, that a particular school should attain a higher achievement rating than another school. Thus, a school in a district largely foreign in its population might face a more difficult educational problem in meeting an objective standard in the reading of English prose. The objective standard, rather than ignoring such conditions, renders its function by enabling teachers and others to isolate these conditions for more effective attack.

The prevailing practice of using grade designations based on years in school slurs over such differential factors and leaves them vague and confusing. What society needs is not that pupils should remain in school six, eight, ten or twelve years, but that its citizens should attain a certain educational proficiency. The state standardizes its schools by years on the assumption that the

designated years in school will produce the needed level of efficiency, and the currency value of the yearly unit is so great that it should not be lightly displaced. Its meaning, however, should be rendered definite in terms of school accomplishment, and the desirable limits of schooling should be fixed in terms of objectively statable social demands.

To be sure, if eighth grade achievement were defined in such objective terms, it would mean that, in order to meet them, certain school districts would need to bestir themselves, to employ better teachers, to erect better buildings, to increase library facilities, to put more money into schools, and to increase taxes. Without question, it would mean that the state should accept a larger financial responsibility for the maintenance of certain local schools. Perchance, it might mean, even with improved school conditions, that certain schools or school districts would require nine or ten years to meet eighth grade standards just as now some pupils in all schools so require. If so, the necessary provision should be so made or the inability of such schools should be frankly admitted. Nothing is to be gained either for the pupils who attend schools or for society for whom the schools exist, by obscuring the facts, and nothing will more quickly excite the vital interest of intelligent patrons than a clear statement of what the facts are.

Special Classes

The abilities of the pupils as recorded in these tests set certain other problems in school organization. From what has already been said regarding their bearing on grade classification and school progress there is apparently a need for special help to particular pupils. Although it will be recalled that the pupils whose scores are here given are not in special classes, there can be little doubt that many of the pupils in these schools would profit by segregation into opportunity classes. Special classes already exist for backward pupils in many New York schools. Many of the pupils tested in the survey would profit by being taught in such classes. The educational values of such classes, both to the pupils in them and to the entire school of which they are a part, are so generally recognized that they need not be elaborated upon here. Their

extension under proper restrictions as to kinds of pupils assigned to them, the quality of the teacher, etc., is to be recommended.

It is not so commonly admitted, however, that classes for gifted pupils are desirable. Few of the rural school districts maintain such classes. It is a problem, however, which every school district should face, whether or not the necessities of gifted children would not be better met by the organization of separate classes. As already noted, the abilities and attainments of such children greatly exceed those of other children with whom they are classed and the organization of a special class is one possible solution of the problems which they present. It is possible that both they and pupils of more ordinary capacities would be better served if opportunity in segregated classes could be afforded the more gifted.

It is not argued here that the most satisfactory solution of the problem of gifted children is segregation, but every administrative officer should face the problem either of the use of segregation as a specific device or of providing some better arrangements within his school district.

CHAPTER VIII

INTELLIGENCE AND ACHIEVEMENT

THE data from the intelligence tests have thus far been used to throw light on problems of the grouping of pupils, school progress, school organization, and educational administration. It remains to inquire to what degree these test results throw light on the achievements of pupils and the efficiency of teaching. As indicated at the beginning of this chapter, it is fair to expect pupils of superior ability to achieve superior results, while pupils of inferior ability may be considered as living up to their possibilities with lower achievements. The good school is one in which every pupil is doing capacity work, that is, living up to the maximum of his possibilities.

From this viewpoint we may now inquire how efficient are the New York schools? There are a number of ways in which the available data may be used to set forth an answer to the general problem thus stated. Let us first assume that the score which a pupil makes in the Delta 2 examination is a satisfactory measure of his mental ability. The question to be answered then is this: Do the achievement test scores show that the pupils of the best ability as measured by this intelligence test achieve the best results? The mass of available results does not permit a complete analysis and discussion. We may, therefore, choose certain samples and examine them in detail. A fairly unselected sample of results may be obtained by choosing grade 8 from the larger schools of Erie county. There are 188 of these eighth grade pupils for whom the scores on all the tests are available. Enough additional cases may, therefore, be selected at random from the eighth grades of Tompkins county to make an even 200 cases.

Dividing this group of 200 eighth graders into decile groups on

the basis of Delta 2 scores we have 20 pupils in each group with median Delta 2 scores as shown in the first column of Table 52. The question now to be answered is, Do the achievements of these several percentile groups differ in the order of their percentile ranking? The answer may be seen in Table 52, where the median achievement of each percentile group is shown for reading (Sigma 3), spelling, addition, multiplication, arithmetical problems and the two tests in American history. The total achievement score given in the last column of the table is obtained by adding all the scores for the several tests.

TABLE 52.—MEDIAN SCORES IN SEVERAL EDUCATIONAL TESTS FOR EACH DECILE GROUP IN INTELLIGENCE EXAMINATION, DELTA 2. 200 CASES, BEING ALL EIGHTH GRADE PUPILS TESTED WITH ALL TESTS IN ERIE COUNTY

Percentile group	Delta 2	Sigma 3	Spelling	Addition	Multiplication	Problems	History information	History thought	Total achievement
1	87.5	48	7	15.5	15	10	26	25.5	147
2	96.5	60.5	8	17	16	12	30.5	32.5	176.5
3	103.5	71	8.5	16	16	12	36	34.5	194
4	109.5	76	8.5	16	15.5	11	34.5	31.5	193
5	113.5	75.5	8	17.5	16	12	39.5	36	204.5
6	118	79.5	8.5	16	16.5	11	39.5	39.5	210.5
7	122.5	84	9	16	16.5	13	43	40.5	222
8	127.5	91	9	16	15.5	13	43.5	41.5	229.5
9	134	97.5	9	17	15.5	13	46	48	246
10	144.5	106.5	9	17	17	14	54	51	268.5

This total achievement score shows a definite step upward from each decile to the one next above, except in the case of group 4, where there is a reversal of 1 point. As between the first and the tenth decile groups there is a difference of 121.5 points. This difference is 82.6 percent of the median achievement of the lowest group.

Not all the tests behave alike. Reading, spelling and the two history tests, each shows one reversal as regard contiguous decile groups. The arithmetic problems test shows two, and multiplication and addition are most erratic of all the tests. If the two tests

in the fundamentals of arithmetic were eliminated, the median scores in the last column would show more marked increases than they do. Apparently, skill in these processes has less relation to the

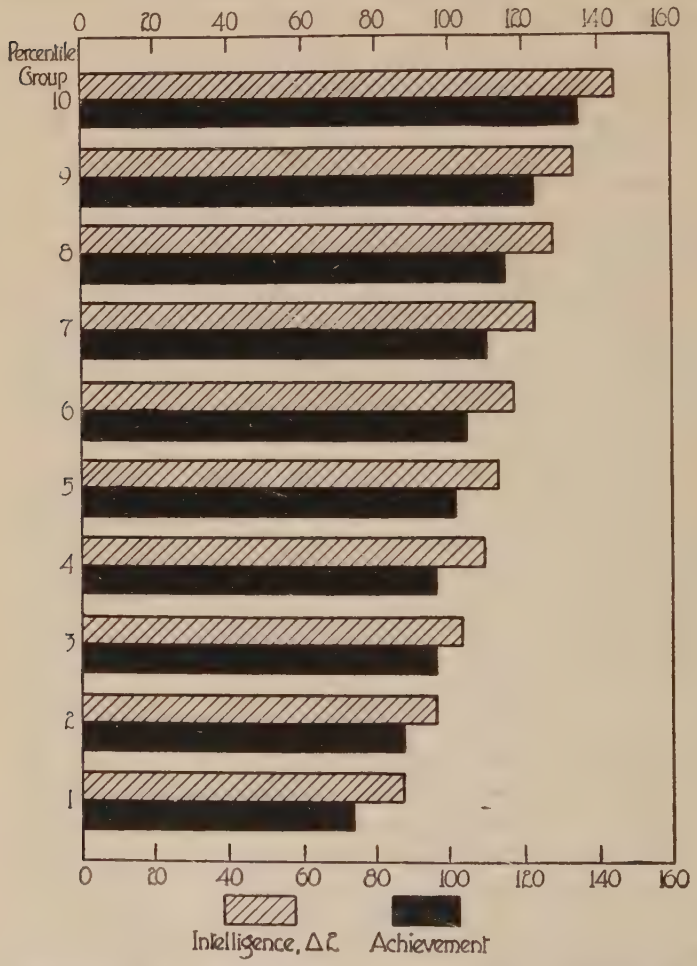

Figure 30.—Comparison for each percentile group in Intelligence Examination, Delta 2, between median total achievement scores and median Delta 2 scores. 200 cases, being all eighth grade pupils tested with all tests in Erie county

abilities measured by the general intelligence tests than do any other achievements. Possibly much more depends upon extended drill. If one considers only the lowest and highest groups, however, even these tests show distinctly superior achievements for the highest group. The relation of intelligence as measured by the Delta 2 test to achievement appears more clearly in Figure 30, where the scores are represented by parallel bar diagrams. For the purposes of this figure the total achievement score is divided by 2 to make it approximate in size the intelligence score. The outstanding fact is the close approximation of the intelligence and achievement scores for the several decile groups and the uniformity in the increasing amount of both from the lowest to the highest ten percent groups. It obviously means something in achievement to have a high intelligence rating.

Reading and Achievement in Other Subjects

In how far the reading examination gives results similar to those for the groups based on the Delta 2 scores may be seen in Table 52A. Here the decile groups are determined by the scores in reading examination, Sigma 3. The sum of the achievement test scores for

Table 52A.—Median Scores in Several Educational Tests for Each Decile Group in Reading Examination, Sigma 3, Form B. 200 Cases, Being All Eighth Grade Pupils Tested With All Tests in Erie County

Decile group	Sigma 3	Delta 2	Spelling	Addition	Multiplication	Problems	History information	History thought	Total achievement
1	45.5	90.5	8	16	16	10	26	28.5	104.5
2	58.5	97.5	7.5	15.5	14.5	10	33.5	32.5	113.5
3	65	107	8	16.5	16	12	33.5	33	119
4	71.5	110	7	16	17	13	32.5	35	120.5
5	76	111	8.5	16	15	11.5	34.5	36.5	122
6	80.5	117.5	8	16	16	11.5	36.5	37	125
7	86	120	8	16.5	15.5	12	44	44.5	140.5
8	92.5	125.5	9	16.5	18	13	42.5	39	138
9	100.5	133	9	16.5	15	14	50	47.5	152
10	111	139.5	10	18	17	13	53	49	160

the lowest group is 104.5. The highest group scores a total of 160, or 55.5 points more than the lowest group. This is a difference of about 50 percent. The behavior of the several tests is slightly more erratic than for the percentile groups based on the Delta 2 scores. In this case the history thought test and the spelling test most nearly approach regular increase of score. The tests in arithmetical fundamentals are most erratic.

Intelligence and Reading Combined

Decile groups may also be obtained by combining the Delta 2 and the Sigma 3 scores. The ratings based on this combination may be seen in Table 53. The achievements are given separately, and combined in the last column. The total achievement scores of Tables 52A and 53 are lower than in Table 52, because the reading

Table 53.—Median Scores in Several Educational Tests for Each Decile Group in Combination of Intelligence Examination, Delta 2, and Reading Examination, Sigma 3, Form B. 200 Cases, Being All Eighth Grade Pupils Tested With All Tests in Erie County

Percentile group	Delta 2 and Sigma 3	Spelling	Addition	Multiplication	Problems	History information	History thought	Total achievement
1	131.5	8	16	15.5	10	25	24	100
2	156	8	16	15	12	32	32	116
3	171.5	9	16	15	11	35.5	33	116
4	182	7	16	16	12	35	36.5	123
5	190	9	16	16.5	12	34	37.5	130.5
6	197	9	16	16.5	11.5	35	36.5	122
7	206	8	16	15.5	13	42	39	131
8	220	9	16	16.5	13	43.5	42	139
9	232.5	9	17	16	14	47.5	46.5	148.5
10	250.5	10	17	16	13.5	54.5	50	159.5

scores are not included. The achievement scores show an increase of about 60 percent from the lowest to the highest decile groups, which is somewhat less than that for the Delta 2 grouping shown in Table 52. This difference in percentage increase is probably due to the absence of the reading scores from the achievement total and their inclusion with the intelligence scores. A bar diagram (Figure

30a) shows like Figure 30 the very definite diagnostic value which the two tests and their combination have as measures of educational achievement.

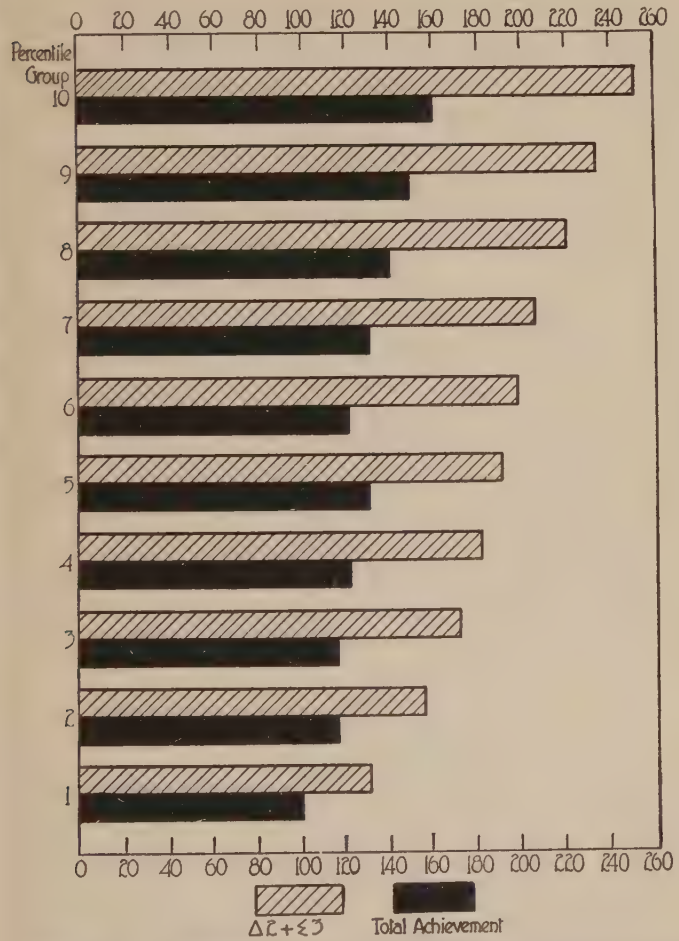

Figure 30a.—Comparison for each percentile group in combination of Intelligence Examination, Delta 2, and Reading Examination, Sigma 3, Form B, between median total achievement scores and median scores in combination of Delta 2 and Sigma 3. 200 cases, being all eighth grade pupils tested with all tests in Erie County

A fact of great significance is the greater relation existing between the intelligence and reading scores, on the one hand, and the scores in history, arithmetical problems and spelling, on the other, than that which exists between intelligence and reading and the scores in the fundamentals of arithmetic. It demonstrates the harm which may be done pupils of high intelligence when their school progress is made to depend largely on their achievement in addition and multiplication. The latter skills, because they are easier of determination, are all too often made the basis of school promotions to the exclusion of the more important, although more recondite, abilities which are the basis of success in thinking subjects, such as history, geography, problems and prose reading.

A Finer Measure of Achievement

The fact that pupils scoring low in intelligence score low in achievement, and that pupils who score high in intelligence score high in achievement does not, however, give a satisfactory measure of school efficiency. What we wish to know is whether these pupils of high intelligence are achieving results up to their capacity. It is not enough that they do better than the pupils of low ability. They should achieve up to the maximum which their abilities will allow. Further consideration may now be given to this problem.

For this further analysis a second group of eighth grade pupils will be used comparatively with the 200-group already described. This second group includes just 100 pupils.

Intelligence Quotients

For this study the scores in the Delta 2 examination are taken as a measure of intelligence. From these scores an intelligence quotient for each pupil was computed by means of Table 25, page 90. The distribution of these quotients with the medians for each group is given in the first division of Table 54. In both groups the range is very considerable, from about 65 to 140 in Group I and from about 70 to 160 in Group II.

It is clear that there is a fairly wide difference between the two groups. In group I the median intelligence quotient is 105. This

is just about normal or slightly above. The median of 115 shows group II to be distinctly above normal. This group as a whole belongs in the class which Terman calls of "superior" intelligence. As a matter of fact, about 40 percent of the group are "of very superior" intelligence, a level reached by only about 4 percent of the population. In contrast, only about 20 percent of group I belong in this "very superior" class. Conversely, the percentage of the two groups belonging to the "dull" and "borderline" levels of intelligence are 8 and 13 percent respectively.

The median scores for the two groups in all the tests are given in Table 55. The Delta 2 for one group is 117 and for the other it is 121.5. This difference is equal to about one-half year of intelligence growth. By comparing the median scores across the table it will be seen that the better intelligence group makes the better record in every achievement test but two, and that in the medians of the combined scores there is a very distinct difference—a difference of 25 points in favor of group II.

Without the intelligence test check on these figures it would be easy to assess this superior achievement to superior school conditions. It is apparent, however, from the intelligence test scores that such an interpretation is altogether too simple for the facts. In order to make an evaluation of school efficiency somewhat more accurately, the data on these two groups may be here submitted to further analysis.

Reading Quotients

In order to make possible a finer measure of reading efficiency age norms were developed for the Sigma 3 examination. The basis for these norms, which are given in Table 53a in terms of years and months, are the scores made by the pupils examined in the New York schools. While the data are not so extensive as those available for similar norms for the Delta 2 test, they still represent a variety of school conditions and large numbers of cases. In finally settling upon the scores for each age the data were submitted to numerous tests similar to those employed for the intelligence tests. The table shows a fairly uniform step up from age to age, although the decreasing differences toward the higher ages indicate that

reading ability as measured by this test does not tend to increase at the same rate as pupils grow older.

A reading growth curve constructed from the data shown in Table 53a is given as Figure 31. The ages covered are not quite the same as those for the mental growth curve (Figure 19), but within

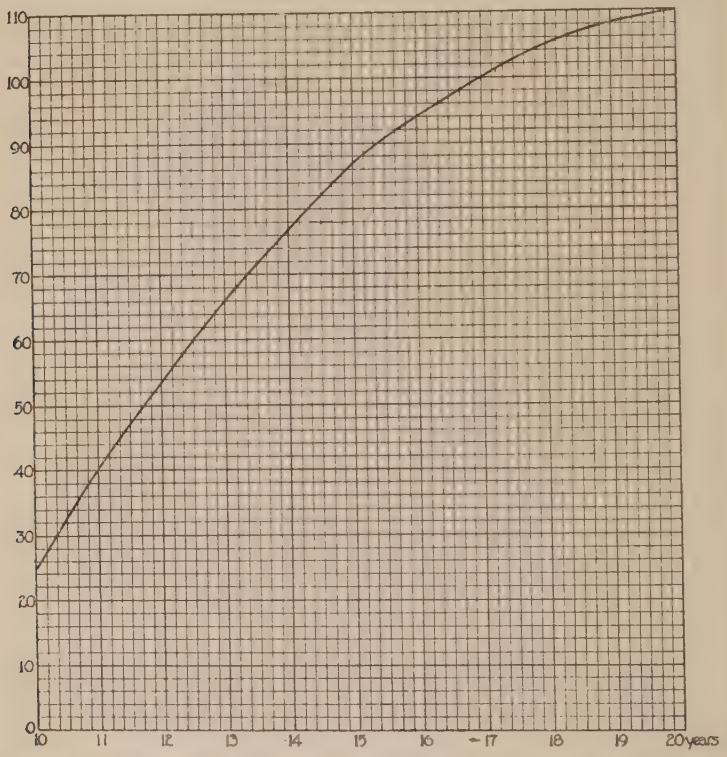

Figure 31.—Reading Examination, Sigma 3, Form B. Reading growth curve. Figures on ordinate indicate score. Figures on base line indicate chronological age

the ages given the similarity of the reading curve to the mental curve is very striking. There is the same steep rise in the earlier years, the same flattening of the curve toward the upper end and the same tendency to rise somewhat even at the 19 to 20 year interval.

TABLE 53A.—READING EXAMINATION, SIGMA 3, FORM B. AGE NORMS FOR INDIVIDUALS OF AGES 10 TO 20 YEARS. FIGURES IN FIRST COLUMN OPPOSITE YEARS INDICATE NORMAL SCORES FOR INDIVIDUALS OF EVEN AGES. FIGURES IN SUCCEEDING COLUMNS TO RIGHT INDICATE NORMAL SCORES FOR MONTHS BEYOND EVEN AGES

Year	Months											
	0	1	2	3	4	5	6	7	8	9	10	11
10	25	26.2	27.5	28.7	30	31.2	32.5	33.7	35	36.2	37.5	38.7
11	40	41	42.5	43.5	45	46	47	48	49	50	51	52
12	53	54	55.5	56.5	58	59	60	61	62	63	64	65
13	66	66.9	67.8	68.7	69.6	70.5	71.4	72.3	73.2	74.1	75.1	76
14	77	77.8	78.6	79.5	80.3	81.2	82	82.8	83.6	84.5	85.3	86.1
15	87	87.5	88.1	88.6	89.1	89.7	90.3	90.9	91.5	92.1	92.7	93.4
16	94	94.5	95	95.5	96	96.5	97	97.5	98	98.5	99	99.5
17	100	100.4	100.9	101.3	101.7	102.2	102.6	103	103.4	103.8	104.2	104.6
18	105	105.2	105.5	105.7	106	106.2	106.5	106.7	107	107.2	107.5	107.7
19	108	108.1	108.3	108.5	108.6	108.7	108.9	109.1	109.3	109.5	109.7	109.9
20	110	..	..	..	..	..	..	..	..	..	..	..

It is possible, by means of Table 53a, to state the reading achievement in terms of age standards and to calculate reading quotients after a method generally familiar in the calculation of intelligence quotients. The distribution of reading quotients so calculated is shown in the second division of Table 54. The range of reading quotients here shown is wide, and there is the same type of difference between the two groups as are shown in the intelligence quotients given in the same table. The medians are 98 and 112 respectively and the percentage of high reading quotients in the one group is very much greater than in the other. Above the level of 110 the percents are 25 and 53 respectively. The direct interpretation of these figures would mean a greater school efficiency for group II than for group I. If, however, we interpret these reading quotients in terms of the intelligence quotients given in the same table, this conclusion is not so obvious.

EDUCATIONAL QUOTIENTS

An effort at this latter interpretation is represented by the data in the third division of Table 54. The figures in this case are

"educational" quotients derived by dividing the intelligence quotient for an individual into the reading quotient for that same individual. To illustrate, a thirteen-year-old pupil should score

TABLE 54.—DISTRIBUTION OF INTELLIGENCE QUOTIENTS BASED ON INTELLIGENCE EXAMINATION, DELTA 2. READING QUOTIENTS BASED ON READING EXAMINATION, SIGMA 3, FORM B, AND EDUCATIONAL QUOTIENTS OBTAINED BY DIVIDING READING QUOTIENTS BY INTELLIGENCE QUOTIENTS. GROUP I CONTAINS 200 CASES. GROUP II CONTAINS 100 CASES. ALL CASES ARE TAKEN FROM THE EIGHTH GRADE

	Intelligence quotients		Reading quotients		Educational quotients	
	Group I	Group II	Group I	Group II	Group I	Group II
60–64	..	..	1	..	..	..
65–69	1	..	3	1	..	..
70–74	3	1	4	1	2	..
75–79	1	1	10	2	8	5
80–84	7	1	14	6	10	6
85–89	14	5	23	4	38	17
90–94	28	6	26	9	40	15
95–99	24	4	**31**	6	**47**	**13**
100–104	22	7	20	11	30	22
105–109	**24**	13	18	7	9	13
110–114	20	11	6	**8**	7	4
115–119	15	**11**	7	6	6	3
120–124	10	8	13	7	3	1
125–129	11	8	7	3	..	..
130–134	10	3	2	6	..	1
135–139	7	3	3	5	..	..
140–144	3	7	6	5	..	..
145–149	..	7	2	6	..	..
150–154	..	1	3	4	..	..
155–159	..	..	..	..	..	..
160–164	..	3	1	3	..	..
Totals.....	200	100	200	100	200	100
Medians...	105	115.5	98	112	95	98

94 in intelligence and 66 in reading. A particular child of this age did score 120 and 109 in the two tests. In terms of the standard for the two tests given in Tables 25 and 53a, the intelligence and

reading quotients for this child are, therefore, 118 and 150. In the calculation of the educational quotient these two quotients are taken as the denominator and numerator of a new fraction, which, reduced, gives 124. The significance of this last quotient is that it combines chronological age, intelligence and educational achievement all in a single figure. As a measure of school efficiency it is presumably superior to the achievement score alone or even to the achievement quotient. Where this educational quotient is high it will mean that the educational product is superior as measured by the chronological age and the intelligence of a pupil. A low educational quotient will mean that the school product is inferior to what the chronological age and the intelligence of a pupil make possible. Such quotients will reveal the school which achieves good results with mediocre native endowment of pupils; they also show the schools which are content with mediocre work from pupils of superior ability.

TABLE 55.—MEDIAN SCORES FOR GROUP I, CONSISTING OF 200 EIGHTH GRADE PUPILS, AND GROUP II, CONSISTING OF 100 EIGHTH GRADE PUPILS IN THE FOLLOWING TESTS: INTELLIGENCE EXAMINATION, DELTA 2, READING EXAMINATION, SIGMA 3, FORM B, SPELLING, ADDITION, MULTIPLICATION, HISTORY THOUGHT AND HISTORY INFORMATION, AND ARITHMETICAL PROBLEMS

Group	Delta 2	Sigma 3	Spelling	Addition	Multiplication	History thought	History information	Problems	Total achievement
I	117	74	18.6	15.9	16.3	34.9	37.1	12.7	*209.5
II	121.5	84.5	18.3	16.5	19	41	44.6	12.3	*236.2

* Sum of all median scores in achievement for each group.

Thus, we have for one pupil the following facts: age, 13 years 5 months; intelligence score 111; reading score 109. These facts give the following quotients: intelligence 109, reading 146, educational 134. For another pupil we have these facts: age 14 years 3 months; intelligence score 130; reading score 70, which give the following quotients: intelligence 117, reading 94, and educational 80. The one of these pupils is of normal intelligence and is achiev-

ing better than normal results in reading; the other is of very superior intelligence and is achieving only ordinary results. The difference in educational dividends which the two schools are securing on the intellectual capital invested is represented by the difference in the two educational quotients of 134 and 80 respectively.

The facts for the lowest and highest educational quotients from each of the two distributions in Table 54 are given in detail in Table 56. Here it will be seen that some of the most intelligent pupils, as measured by the Delta 2 examination, are actually making the poorest school records as shown by the educational quotients. Conversely, some pupils of mediocre ability are achieving excellent results as measured by this quotient.

TABLE 56.—EDUCATIONAL QUOTIENTS. DETAILED SCORES AND QUOTIENTS FOR HIGHEST AND LOWEST EDUCATIONAL QUOTIENTS FOR EACH GROUP

Pupil	Group	Age	Delta 2 score	Reading score	Intelligence quotient	Reading quotient	Educational quotient
1	II	15 yrs. 6 mos.	105	37	90	70	77
2	II	14 yrs. 2 mos.	142	85	136	104	76
3	II	12 yrs. 5 mos.	152	87	161	121	75
4	II	13 yrs. 2 mos.	147	88	151	115	76
5	II	14 yrs. 3 mos.	130	70	117	94	80
6	II	13 yrs. 5 mos.	111	109	109	146	134
7	I	16 yrs. 2 mos.	110	51	90	73	81
8	I	12 yrs. 6 mos.	126	111	129	160	124
9	I	13 yrs. 1 mo.	120	109	118	149	126
10	I	14 yrs. 10 mos.	68	58	73	83	113
11	I	15 yrs. 1 mo.	134	65	115	85	74

The distribution of these educational quotients and the medians for the two groups are shown in Table 54. Here we have the same wide range of quotients, but when the median educational quotients are considered it is clear that the schools of Group II are not so superior as the gross scores made them appear to be. The difference in median educational quotients is 3 points and in case of both groups the median is below one hundred, which should be normal educational achievement.

The absolute size of this median quotient is subject to a number

of influences that are more or less dependent on the technique of measurement. Thus, obviously, the reading quotients are dependent, among other things, upon the correctness of the age norms for the reading test. If these norms are slightly higher than they should be, the reading quotients would be thereby reduced, and these lowered reading quotients would serve to reduce the educational quotients. Errors of this type should, however, be the same for both groups of pupils, and would not explain away the fact that these two median quotients come much more closely together than do the medians for the intelligence and reading quotients. The apparent explanation of the latter fact is that the schools included in group I are securing practically as good educational dividends on the intellectual capital invested as are the apparently better schools, although the gross achievement scores indicate that the schools of group II are superior. Such superiority as does exist in these schools is obviously due to the capacities of the pupils and not to anything inherent in the technique of the school as such.

The absence of satisfactory age norms for some of the tests makes a further analysis of these data of doubtful value. The illustration from the reading tests amply illustrates one method by which the efficiency of the schools must, in the long run, be judged. The schools cannot be credited with the original capacities of the children which come to them. They must, however, be charged with what happens to those children while under the tutelage and care of the school, and the method of educational quotients here illustrated marks a distinct forward step in the critical evaluation of school work.

The significance of this method of evaluating school work is far reaching. In the first place, it means that test scale values must be stated in terms of ages of pupils as well as in terms of grade standards. It also means that teachers can be credited with good teaching of ordinary and even of inferior children, and that the mere accident that a group of pupils are of superior capacity will not in itself confer upon the teacher of that group the brand of superior teaching efficiency. By its finer analysis the method gives a truer measure of the elements involved in school achievement and is, therefore, fairer to pupils, teachers, and the general public.

CHAPTER IX

AMERICAN HISTORY

RECENT events of world-wide interest have emphasized the importance which attaches to a knowledge of American history on the part of all active citizens. By general assent the basic facts of our history are proper subject matter for the elementary schools. The syllabus of the New York State Department of Education provides for teaching the essential facts about important personages connected with American history in the fifth grade, and the *rural schools* are advised "to begin this work about October first and continue it to completion with two lessons a week." For the seventh and eighth grades, the syllabus plans "200 lessons" in history and makes provision for correlating such material with geography and literature.

In trying to evaluate the efficiency of the rural schools, therefore, it seemed pertinent to inquire as to the amount of historical knowledge which is possessed by the pupils. Accordingly two American history tests[1] were given to 2000 pupils in grades 7 and 8.

It should be pointed out that the addition of the history tests to the examination program is something more than the mere addition of another test. It, doubtless, measures the schools in a different way than do tests in spelling or the fundamentals of arithmetic or handwriting. Into the teaching of these latter subjects the method of drill enters very largely. Whether or not pupils make high scores in these drill subjects depends to a great extent upon the amount of such drill which they have been given in school. The effect of what one may call rote drill is probably less important in an informational subject, such as American history. To a large extent good history teaching calls for another type of instruction

[1] Selected items from the Van Wagenen American History Scales.

and a different sort of skill in the teacher. The history tests used in the survey stress these differences, and the results, therefore, add much more to our knowledge of the schools than would another test in a drill subject.

The History Tests

Information Questions

Two types of questions were used—*information* questions and *thought* questions.[1] The information questions were designed to show how many of the basic facts of American history were known by the pupils. The first and easiest question of this test was:

"1. Name any man besides Columbus who made early explorations in America."

The successive questions in this scale range upward in difficulty. The following representative questions chosen from successive levels of the scale indicate the scope of this examination:

"11. Who was President of the United States when Louisiana was purchased?"

"16. Arrange these events in the order in which they occurred by putting a '1' before the event that occurred first, a '2' before the event that occurred second, and so on until you have put a '7' before the event that occurred last.

..... Settlement of the Massachusetts Bay Colony.
..... Adoption of the United States Constitution.
..... Settlement of Jamestown.
..... Battle of Yorktown.
..... Capture of New Amsterdam by the English.
..... Declaration of Independence.
..... Fall of Quebec."

"22. What new means of transportation came into use in the United States during each of the following periods: 1805 to 1815? 1830 to 1840? 1890 to 1900?"

[1] Selected items from the Van Wagenen History Scales. Historical Information and judgment in pupils of Elementary Schools. Teachers College, Columbia University Contribution to Education, No. 101, 1919. The selection was made by Professor Van Wagenen and the scoring and evaluation of the results were done under his direction.

"24. Put a check mark √ in front of each of the following things which the Southern states were in favor of between 1840 and 1850:

..... Wilmot Proviso.
..... William Lloyd Garrison's 'The Liberator.'
..... Protection of slavery in the territories.
..... Free Soil Party.
..... The 'gag rule' of suppression of abolition petitions in Congress.
..... Admission of California as a state.
..... Protective tariff on manufactured goods."

Thought Questions

The second series of history questions call for more than a memory of the facts of history. The facts are given in the question itself and the pupil is called upon to make a satisfactory inference from the given facts. In this series of questions the easiest item is,

"1. In 1754, the English claimed the Ohio Valley. The French, however, had built Fort Duquesne on the Ohio River, near where Pittsburgh now stands. George Washington was sent by the English to demand that the fort be given up to the English. (a) What reply would you expect the French to make to Washington? (b) What would you expect the English to do next?"

The range of difficulty upward is represented by the following selected samples:

"4. In 1793, Eli Whitney invented the cotton gin, a machine for separating the cotton seed from the fiber. By the use of this machine one slave could clean fifty times as much cotton in a day as with the old machines or by hand. (a) What effect would this invention have upon the cost of raising raw cotton? (b) What indirect effect would it have upon the price of cotton goods? (c) What effect would it have upon the amount of cotton raised?"

"10. In 1850, the principal occupation of Virginia was agriculture. In Massachusetts at that time there were as many people engaged in manufacturing as in agriculture. (a) In which state would you expect to find the more cities at that time? (b) In which state would you expect to find more foreign-born people?"

"16. In 1900 Baltimore and Boston had each a population of about 600,000; but there were 69,000 foreigners in Baltimore as

against 197,000 in Boston. New Orleans and Milwaukee were not far apart in total numbers in 1900, but Milwaukee had 90,000 foreigners to 30,000 in New Orleans. Atlanta, with a population of nearly 100,000, had only about 3,000 foreign-born people in 1900 while St. Paul with a similar population had 47,000. What do these figures, which may be considered as typical, show about the population of the Southern cities as compared with the population of the Northern cities?"

"17. The ninth and tenth amendments to the Constitution state clearly that Congress shall exercise only those powers given to it by the Constitution and that 'all other powers are reserved to the states.' Some of the states ratified the Constitution only upon being assured that such a provision would be added to it. Of what must the states have been afraid?"

Quality of the Tests

A number of considerations arise in regard to the validity of these history tests. In how far may the examinations as given be regarded as a valid measure of the achievements of the eighth grade pupils in American history? To what degree may these results be used as a valid measure of the teaching of history? It may be argued, for instance, that the time limit of twenty minutes was too short to allow pupils to do themselves justice. Some strength may be allowed to this argument, but the general observation of examiners was that the pupils usually quit work before time was called. An extension of time would, therefore, not have affected the median achievement very much if at all. In any case this could not have accounted for the variability among schools and districts since the time was the same for all.

Again it may be urged that pupils might fail on the questions as given but might succeed on another list of questions. The extended experimental work which Professor Van Wagenen did in constructing the test renders this unlikely. Nor is it likely that another trial on the same or a similar test would give greatly different results. The coefficient of correlation for trials with two forms of the history tests ranges from $.70 \pm .01$ to $.77 \pm .005$ (Pearson Products-Moment Method). These coefficients are figured on one school grade. The two types of tests are about equally reliable in terms of this measure of reliability.

The tests have also been checked against the results of the history examination given by the Regents in June, 1921. For the two tests combined, the coefficients based on all eighth grade cases available from one supervisory district are about .61 ± .005 (unlike signs).

TABLE 57.—COEFFICIENTS OF CORRELATION. (PEARSON PRODUCTS-MOMENT METHOD.) TWO TRIALS WITH PARALLEL FORMS OF VAN WAGENEN HISTORY SCALES

Information	Boys	.718	P.E. .01
	Girls	.697	P.E. .01
	Both	.77	P.E. .005
Thought	Boys	.726	P.E. .01
	Girls	.751	P.E. .005
	Both	.769	P.E. .004

While these correlations are not so high as one could wish for dependable measures, they do indicate a desirable constancy in the results of the two tests.

HISTORY, READING AND INTELLIGENCE TESTS

Some interest attaches to the relation of the two history tests to the tests in reading and the intelligence examination which were given to the same pupils. In so far as this relation may be represented by raw coefficients of correlation the facts are given in Table 58.

TABLE 58.—COEFFICIENTS OF CORRELATION. INTELLIGENCE EXAMINATION, DELTA 2, READING EXAMINATION, SIGMA 3, AND VAN WAGENEN HISTORY TESTS. 152 CASES IN GRADE 8

		Intelligence examination Delta 2	Reading examination Sigma 3	Combined score of Delta 2 and Sigma 3
History information	r =	.45	.50	.54
	P.E. =	± .043	± .041	± .04
History thought	r =	.71	.78	.69
	P.E. =	± .028	± .024	± .03
Combined history tests	r =	.63	.63	.79
	P.E. =	± .033	± .035	± .024

Coefficient: History information and History thought = .60 ± .035.

Apparently from these coefficients the "thought" test in history bears a very considerable resemblance to the Delta 2 examination. The resemblance of the history information test to the Delta 2 examination is less evident.

The coefficients range from .45 ± .043 for the Delta 2 and the history information to .79 ± .024 for the combined scores of Delta 2 and Sigma 3 and the two history tests combined. There is apparently much greater difference between the history information test and either of the intelligence or reading tests than there is between either of these tests and the history thought test. For the history thought test and each of the other tests the coefficients are .71 and .78; the coefficient for the two history tests is .60 ± .035.

The significant relation between the results of the history tests and the combined scores in the Delta 2 and Sigma 3 examination may be seen further in Table 59. These figures, which are from the same group of pupils which furnished the data for the correlations in Table 58, show very great difference between the history achievements of the first and fourth quartiles of this group. The twenty-five percent scoring lowest in the combined tests have an average of 34 points in the information test and 30 points in the thought tests. The highest twenty-five percent in the combined tests score 49 points in each of the two history tests. To put the matter differently, the lowest group achieve seventh grade standing; the highest group greatly exceed eighth grade standing. The difference between the two groups is considerably in excess of a full year of school progress.

TABLE 59.—AVERAGE SCORE IN HISTORY TESTS FOR LOWEST AND HIGHEST TWENTY-FIVE PERCENTS OF COMBINED DELTA 2 AND SIGMA 3 SCORES

	Information test	Thought test
Lowest 25 percent	33.7	29.7
Highest 25 percent	48.8	49.0

RESULTS OF THE TESTS

These tests were given in the order indicated in grades 7 and 8 to every pupil in attendance on the day the examiner visited the schools. The results should show accurately the history teaching product in these schools. The net testing time allowed for each test was twenty minutes.

There will be small difference of opinion about the desirability of American citizens knowing the types of facts called for in the history of information test. And all will assent to the importance of such citizens being able to think about historical facts in the manner called for in the series of thought questions. Further, all will doubtless subscribe to the assumption that the public elementary school is the normal agency for teaching such facts and developing such skill. It would, therefore, be a distinct mark of merit if the public rural schools were found to be achieving this result. Such a finding would go far toward justifying the public expenditure in behalf of these schools.

The efficiency with which the rural schools teach American history may best be observed by the results of the tests in grade 8.

The scores in grade 7 indicate that the eighth grade results fairly represent the entire history situation in these schools. The pupils tested in this grade were within a few weeks of the end of their elementary course and their achievements may, therefore, be assumed to be a true measure of the elementary school product.

The Information Test

The facts are given for the information test in Table 60, where the distribution and median scores are available.

Two comparisons from this table are pertinent to an evaluation of the rural schools. In the information test the New York City pupils in grade 8 score 42 points, and the pupils in grade 7 score 32 points.[1] The median for the larger rural schools is 39, which is short of the New York City standard about one-third of a year's progress. In the case of the one-teacher schools, the score is 31, which is just below the New York City achievements in grade seven. The handicap of these one-teacher schools is, therefore, the equivalent of a full year of school work in terms of New York City progress. This deficiency is all the more serious in view of the large elimination in the eighth grade of the smaller schools.

Also the advantage lies with the larger rural schools as compared with the smaller schools. Although these larger schools are still below the New York City achievements they are almost a full

[1] Computed by Professor Van Wagenen from data available.

year's progress ahead of the one-teacher schools. The bar diagram shown in Figure 32 gives visual representation to these facts.

TABLE 60.—HISTORY INFORMATION. DISTRIBUTION AND MEDIAN SCORES OF EIGHTH GRADE PUPILS IN ONE- AND FOUR-TEACHER SCHOOLS

	One-Room	Four-Room
0	3	2
1– 5	1	1
6–10	8	5
11–15	12	17
16–20	27	31
21–25	22	76
26–30	54	96
31–35	**36**	120
36–40	34	**138**
41–45	25	132
46–50	19	112
51–55	6	75
56–60	..	24
61–65	1	11
66–70	..	3
71–75	..	..
Total	248	843
Median score	31	39
New York City, Grade 8	42	..
New York City, Grade 7	32	..

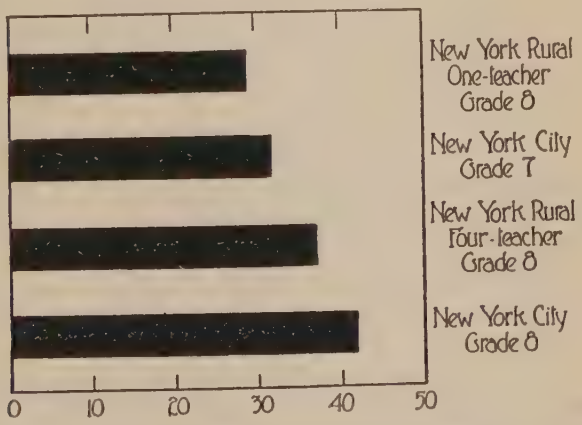

Figure 32.—History information. Showing median achievement in grade 8, one- and four-teacher schools of New York rural schools and median achievement of grades 7 and 8 in New York City schools

The Thought Test

In Table 61 are shown the results of the test on thought questions. As in the case of the information tests the maximum score possible is 75. The larger schools have a median of 37 and the smaller schools a median of 29. The distributions, with medians, are given in Table 61, and the latter are shown graphically in Figure 32a.

Table 61.—History Thought. Distribution and Median Scores of Eighth Grade Pupils in One- and Four-Teacher Schools

	One-Room	Four-Room
0	3	1
1– 5	1	8
6–10	8	10
11–15	16	23
16–20	27	32
21–25	39	63
26–30	**45**	103
31–35	43	127
36–40	42	**152**
41–45	14	130
46–50	6	100
51–55	3	57
56–60	1	31
61–65	..	3
66–70	..	4
71–75	..	1
Total	248	845
Median score	29	37
New York City, Grade 8	42	..
New York City, Grade 7	32	..

The interpretation from the information tests already given may be repeated here for the thought tests. The four-teacher schools are slightly below the median of New York City achievement and the one-teacher schools are below the achievement of New York City seventh grades.

These deficiencies in amount reach about a half year's progress for the larger schools and more than a year's progress for the smaller schools.

How the school districts differ in history achievement is apparent from Table 62, which gives the median scores for both sets of questions for the two types of schools. In certain of these districts the scores are high—distinctly higher than median New York City

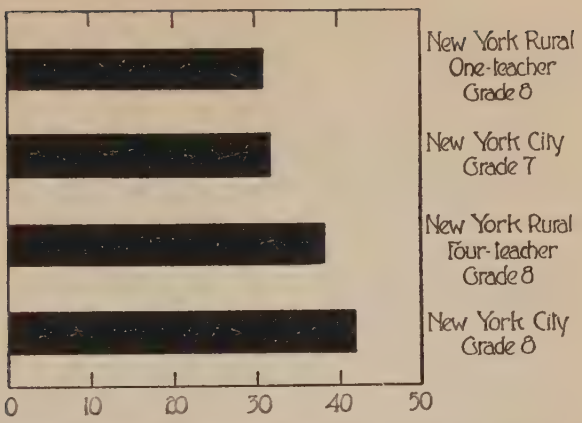

Figure 32a.—History thought. Showing median achievement in grade 8, one- and four-teacher schools of New York rural schools and median achievement of grades 7 and 8 in New York City schools

scores. In others they are distressingly low. The range from the poorest group of schools to the best group of schools is approximately equivalent to the progress of normal pupils through two years of schooling.

TABLE 62.—HISTORY THOUGHT AND INFORMATION. ONE- AND FOUR-TEACHER SCHOOLS. GRADE 8. MEDIAN SCORES BY COUNTIES

Test	School	Counties												
		Cayuga	Clinton	Columbia	Erie	Herkimer	St. Lawrence	Tompkins	Wayne	Westchester	Otsego	Oswego	Livingston	Monroe
History thought	One-teacher	27	*	31	26	31	30	31	29	*	26	31	..	..
	Four-teacher	32	39	36	40	*	33	39	32	41	37	41	36	43
History information	One-teacher	23	*	41	28	27	34	34	37	*	30	32	..	..
	Four-teacher	31	39	42	37	*	32	32	37	45	49	37	38	38

The result of these history tests is in keeping with the results of the reading tests and is doubtless closely connected with the defi-

ciency of reading ability on the part of rural pupils. Children who cannot read have not the tools necessary to master American history. The lives of American leaders, the steady march of progress across the American continent, the industrial revolution, the writing of the American constitution, the social, economic and political evolution of the American nation are to them a closed book, closed as effectively as if it were written in a foreign language or were sealed under a combination lock.

Events connected with the World War made us think much about our problem of Americanizing the foreigners who come to our shores. This is an important matter. It is equally important that our public schools shall lay the basis for Americanizing our native-born. The foundation of a genuine Americanization is a knowledge of American history, and the basis for acquiring this knowledge is an adequate mastery of the language in which that history is recorded. Judged by the degree to which their pupils have this knowledge and mastery, the rural schools of New York are distinctly and sadly deficient and the smaller schools most deficient of all.

Attention has already been called to the fact that rural citizens now, as never before, need the ability to read about, understand and effectively grapple with complicated problems of the modern world—problems and situations that are shot through with the elements of economic, political and social forces. It cannot be too strongly stressed that the preparation of the future rural citizens of New York State is vitally connected with the teaching of American history in the rural elementary schools in the year 1922. What the rural child learns of the intricate problems of effective citizenship, he learns largely in connection with his study of history. What promise of intelligent understanding is there for the future men and women if the boys and girls now in our schools are so poorly taught the fundamental facts in the study of our national life? Every individual interest of these future citizens and every vital interest of rural social life demand something better in the way of history teaching than the boys and girls of rural New York are now getting.

CHAPTER X

SPELLING

CLOSELY related in importance to the ability to read English is the ability to write it. Every intelligent person is called upon in the course of his life to write letters and to set down in readable form his own ideas upon topics of greater or less importance to his own and others' welfare. Expression in written form is a very complicated process, involving a number of more or less separate abilities, among which is the ability to spell words. Formal education everywhere recognizes the importance of teaching young people to spell, and recently there has been a distinct tendency to emphasize more than formerly the teaching of spelling in the high school and even in college classes.

The justice of including a spelling test in an evaluation of school work is therefore obvious. Numerous lists of words standardized for frequency of occurrence and for spelling difficulty are now available. No claim is here made that the list used in the New York Survey is the best list. That it is a fair list and a good measure of spelling efficiency is attested by the sources from which it is derived and from the results obtained by its use elsewhere. The words as arranged were selected by Dr. F. S. Breed in connection with the Virginia Survey. A quotation from the report of that survey will be our best description of the test.

"For the purpose of this survey it was decided to attempt the construction of a test that would meet the following requirements: It should (1) conform to the type of test used by Ayres, namely, a column test; (2) economize the time of pupils and examiner; (3) contain words in the natural vocabulary of the children; (4) provide lists of words of equal difficulty for all the grades tested; (5) provoke in smallest degree misunderstanding during dictation because of

the examiner's or pupil's dialect; (6) cover the range of ability represented in grades three to seven, and (7) yield a body of results that would lend itself to the application of approved methods of statistical treatment.

TABLE 63.—REGULAR WORD LIST

No.	Words	Column in Ayres scale	Grade in Bauer and Jones lists	Mid-year percentage standard					Absolute value
				III	IV	V	VI	VII	
1	come	G	2–2	..	..	..	..	..	7.5
2	was	H	2–2	92	..	..	..	..	8.5
3	foot	I	2–2	88	..	..	..	..	9.5
4	happy	J	2–2	84	..	..	..	..	10.5
5	could	K	2–2	79	92	..	..	..	11.5
6	once	L	2–2	73	88	..	..	..	12.5
7	pretty	M	2–2	66	84	92	..	..	13.5
8	always	N	2–2	58	79	88	..	..	14.5
9	uncle	O	3–2	50	73	84	92	..	15.5
10	beautiful	P	4–3	42	66	79	88	..	16.5
11	surprise	Q	5–4	34	58	73	84	92	17.5
12	vessel	R	5–5	..	50	66	79	88	18.5
13	century	S	7–7	..	42	58	73	84	19.5
14	invitation	T	7–7	..	34	50	66	79	20.5
15	necessary	U	6–6	..	..	42	58	73	21.5
16	experience	V	7–7	..	..	34	50	66	22.5
17	athletic	W	6–5	..	..	..	42	58	23.5
18	convenient	X	7–7	..	..	..	34	50	24.5
19	decision	Y	0–9	..	..	..	..	42	25.5
20	recommend	Z	0–8	..	..	..	..	34	26.5

"The regular survey word list appears in Table 63. It consists of twenty words in the form of a scale, one word from each of columns G to Z, inclusive, of the Ayres scale. Words 2–11, inclusive, were used as the test or crucial words for grade three; 5–14, for grade four; 7–16, for grade five; 9–18, for grade six; and 11–20, for grade seven. As the percentage standards in the table indicate, these various tests of ten words each were of equal difficulty, according to the Ayres scale, for the grades mentioned in connection with them. This arrangement of words was especially convenient for testing rural and village schools where pupils of many grades, or all grades from three to seven, were tested at one time.

"In the fourth column of the table is seen the grade position occupied by the word in the spelling vocabularies prepared by Nicholas Bauer[1] and W. Franklin Jones.[2] These vocabularies contain the words most commonly used in the written compositions of children of various grades. Bauer confined his study to pupils in the New Orleans public schools, while Jones used the compositions of pupils in four different states. The first figure in the column showing grade position in each case represents the grade classification of the word in the Bauer list; the second, the grade classification in the Jones list. So far as possible words were selected for the survey test that satisfied the principle of childhood use, and on which Bauer and Jones gave identical grade indices. Much has been made of the principle of social use in studies of curriculum-making, and by social use has too often been meant merely adult use. The Ayres list of 1000 words is based wholly on adult use. It cannot be safely assumed that such a list fully satisfies the requirements of childhood use. Unpublished studies made by the writer indicate clearly that vocabularies based on the two principles differ to a considerable degree. This difference is probably not due entirely to the probable error of the methods of deriving such vocabularies.

"Under 'Mid-year Percentage Standards' appear the Ayres percentages of correct spelling for each word in each grade for which the test was constructed, and in the last column the absolute value of each word in terms of scale units. Each unit of value in this column represents a distance on the scale equal to one-fifth of a 'sigma,' which in turn represents a unit of spelling difficulty. The numerical value for a given word represents the number of such difficulty units it is located above the point of zero difficulty on the scale. This zero point is assumed to be located at the point where, theoretically, it should come on the Ayres scale, namely, at the point where the second-grade group spells with one hundred percent accuracy. This point is one unit below the lowest published

[1] Nicholas Bauer: The Writing Vocabulary of Pupils of New Orleans Public Schools, Department of Superintendence, 1915.

[2] W. Franklin Jones: Concrete Investigation of the Material of English Spelling, University of South Dakota, 1914.

column of the Ayres scale and would represent the difficulty of words three units less difficult than the words 'it' and 'is,' two units less difficult than 'go' and 'at,' and one unit less difficult than 'me' and 'do.' This zero point is located fifteen units below the median of the third grade, slightly below Buckingham's assumed zero point, which was located about thirteen and one-half of the same units below the median of the third grade. Considering the difference in the conditions under which the two scales were developed this difference in the location of the zero point is not at all surprising.

"It is seen, by an examination of the absolute values in the last column of the table, that the words of the lists vary in difficulty from 7.5 to 26.5, and that the most difficult word in each grade is about twice as difficult as the least difficult word.

"Such a point scale enables us to take account of the specific difficulty values of the various words in making our measurements of spelling achievement. Ordinarily, in attempts at exact measurement, the problem of scoring according to the difficulty of the individual words has been overcome by selecting a spelling list composed of words of equal difficulty. This plan did not seem economical in a survey of rural schools."[1]

Results

The distribution of spelling scores for the crucial words of the tests for grades 4, 6 and 8 are given for 1 and 4 teacher schools in Tables 64 and 65. These tables show the percentages of correct spellings, the number of pupils in each of the three grades making each percentage, the total number of cases in each grade, the median percentage score and the median chronological ages of pupils in each of the three grades.

The simplest interpretation of these results is in terms of the median percentages achieved by the several schools. The median scores for the two types of schools, together with the standard achievement for 84 cities throughout the country are gathered together in Table 66. The scores for the larger schools, and for the

[1] Virginia Public Schools, Part 2, pp. 92 ff.

eighth grade in the smaller schools, compare favorably with the standard for the 84 cities. In all of these grades the pupils achieve average or better than average results. Figure 33 gives a graphic picture of these facts for the two types of schools. The facts for grades 5 and 7 are not given but the quality of scores for these two grades are represented by the scores for the three grades reported.[1]

TABLE 64.—SPELLING: FOUR-TEACHER SCHOOLS. GRADES 4, 6, AND 8. DISTRIBUTION OF SCORES BY GRADES. MEDIAN SCORE AND AGE FOR EACH GRADE

Percent correct	Grades		
	4	6	8
0–9	12	5	..
10–19	17	14	3
20–29	46	25	7
30–39	69	50	13
40–49	66	50	14
50–59	90	91	31
60–69	**110**	114	59
70–79	106	**108**	89
80–89	77	115	**99**
90–99	55	88	111
100	18	40	89
Total	666	700	515
Median score	63	70	84
Median age	10.7	12.6	14.6

It is clear from Table 66 and Figure 33 that the larger schools achieve superior results in spelling. This fact is further emphasized by Table 67 and Figure 34 which give the percentage scores for the pupils of ages ten, twelve and fourteen represented in the three grades here reported. Discrepancies between the spelling achieve-

[1] The tabulation of scores for all five grades by a different method shows this to be true.

TABLE 65.—SPELLING: ONE-TEACHER SCHOOLS. GRADES 4, 6, AND 8. DISTRIBUTION OF SCORES BY GRADES. MEDIAN SCORE AND AGE FOR EACH GRADE

Percent correct	Grades		
	4	6	8
0–9	24	3	..
10–19	33	12	5
20–29	52	36	7
30–39	45	47	14
40–49	64	65	19
50–59	**68**	72	32
60–69	87	**63**	41
70–79	71	66	**51**
80–89	31	45	51
90–99	15	37	41
100	2	18	25
Total	492	464	286
Median score	54	60	74
Median age	10.6	12.5	14.3

TABLE 66.—SPELLING: ONE- AND FOUR-TEACHER SCHOOLS. GRADES 4, 6, AND 8. MEDIAN SCORES BY GRADES. STANDARD SCORE FOR EACH GRADE

Schools	Grades		
	4	6	8
One-room school	54	60	74
Four-room school	63	70	84
Standard, first half year	66.6	66.6	66.6

ments of the two types of schools, similar to those found in reading are easily apparent. If these figures are to be accepted for what

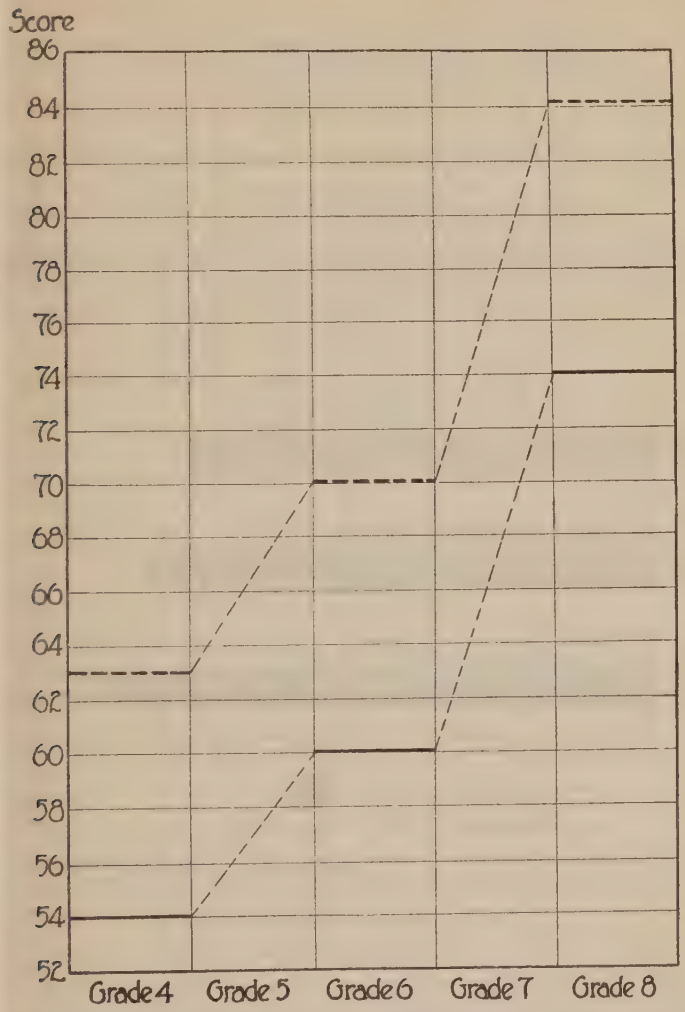

Figure 33.—Spelling: One- and four-teacher schools. Grades 4, 6, and 8. Median scores by grades. (Solid line = one-teacher schools. Broken line = four-teacher schools. Dotted parts of lines = grade omitted.)

they seem to show, it is apparent that the pupils in the larger schools have a better chance to learn correct habits of spelling than do the children in the smaller schools.

TABLE 67.—SPELLING: ONE- AND FOUR-TEACHER ELEMENTARY SCHOOLS. GRADES 4, 6, AND 8. MEDIAN SCORES BY AGES

Schools		Age in years							
		8	9	10	11	12	13	14	15
New York	One-room elementary schools....	56	52	57	63	59	70	60	68
	Four-room elementary schools...	70	63	65	70	71	72	79	78

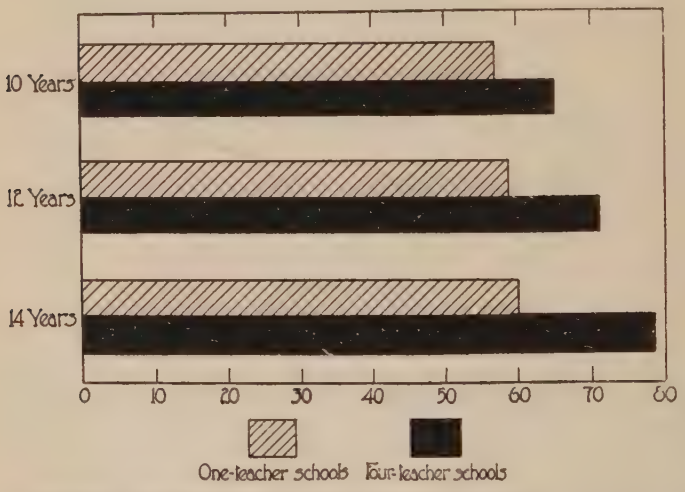

Figure 34.—Spelling: One- and four-teacher schools. Ten, twelve and fourteen year old pupils from grades 4, 6, and 8: Median scores by ages

CHAPTER XI

ARITHMETIC

THE New York syllabus in arithmetic is perfectly clear on the importance of adequate training in the fundamental processes. It opens with the following statements:

"The work in arithmetic should, first of all, produce accuracy and rapidity in computation. Accuracy can be assured only by holding the pupil to exactly correct results and by making him detect and correct even the slightest error.

"Rapidity of computation can be secured only through much practice and drill. Throughout the first three years of the work *the entire time in the subject should be given to securing this accurate and rapid work in the fundamental operations.*"

Then follow the details of the arithmetic course by half years with numerous injunctions for drill and memorization of processes. At the beginning of the seventh year the following general statement (seventh and eighth years) is given:

"Pupils who have completed the work of the six preceding grades should be able (1) to read reasonably large numbers at sight and to write numbers rapidly from dictation; (2) to add problems five figures wide and 20 numbers deep accurately at a fair rate of speed, *i. e.*, in about two minutes; (3) to perform all fundamental processes in arithmetic rapidly and accurately; (4) to reason quickly and explain simple problems; (5) to handle ordinary fractions—common and decimal—without hesitation; and (6) to comprehend the fundamental principles of percentage and their applications.

"Give plenty of oral drill in getting approximate results. This will tend to reduce error in computation. In business it is customary to apply some kind of a check to every result obtained. No good mechanic or business man would think of letting his results stand without some checking. Pupils should acquire the verification habit.

"Mental arithmetic should occupy a large share of the time. Never allow pupils to use pencil if, in your judgment, the result should be obtained mentally.

"In general, papers should be marked, as they are in business, largely by the accuracy of the result. If the result is wrong the paper is wrong. If the problem requires some interpretation a teacher may quite properly mark both for accuracy and for method.

"Teachers should endeavor to get outside the book and to have a large amount of drill material ready for each exercise."

The initial instruction for the eighth year is for "Rapid Calculation Work."

"In this drill include daily speed exercises. Set a reasonable time limit and hold the class up to it. This will fit the pupils for pressure work, which is bound to come in business life. It may include practice in the following:

(*a*) Addition until pupils can add at the rate of from 75 to 100 figures a minute. Use group method, as illustrated by the following example:

3		3	
2	9	2	
4		1	10
		4	
5			
5	10	3	
		6	9
2			
5	10		
3		7	
		3	10
6			
4	10	9	
5		2	
1	10	5	10
4		3	
49		48	

"At first combine only up to 10. Larger groups may be practised later.

"Horizontal addition should be practised. Example: 10 pieces of cloth—38, 82, 91, 46, 53, 67, 84, 75, 65, 69 = 670, at 50 cts. = $335.

"(*b*) Multiplication, when multiplier is 11, 22, 33, 44, etc. Ex-

ample: $892 \times 11 = 2$ as unit figure; $(9 + 2 = 11)$ 1 as tens; $(8 + 9 + 1$ carried $= 8)$ 8 as hundreds; $(8 + 1$ carried $= 9)$ 9 as thousands; final result 9812. Example: $596 \times 22 = 13112$. Same as preceding process except that each addition is multiplied by two before carried figure is added.

"(*c*) Cost of articles sold by ton of 2000 pounds. Example: 8942 pounds at \$25.50 per ton = $8.942 \times$ (½ of \$25.50) = \$114.01.

"(*d*) Interest practice, short method given above. Only a few practical short methods should be given. This work will help to sustain interest and develop rapid thinking power of concentrated effort."

With this emphasis upon drill work in fundamental process by the State Department syllabus, it is reasonable to expect that the public school children of the state would excel in arithmetical computation. As a measure of the validity of this expectation the Woody scales in Addition and Multiplication were given to all elementary pupils in grades 3 to 8 inclusive.

The problems in both scales are arranged in an order of difficulty with very easy problems at the beginning and difficult ones at the end of the test. The following are representative examples for each of the two scales:

ADDITION

2	$25 + 42 =$	\$12.50
3		16.75
—		15.75
		———

547		
197	$⅓ + ⅓ =$	4.0125
685		1.5907
678		4.10
456		8.673
393		———
525		
240		
152	$25.091 + 100.4 + 25 + 98.28 + 19.3614 =$	
—		

MULTIPLICATION

$3 \times 7 =$	5096	24	6.25
	6	234	3.2
	—	—	—
$987¾$			
25	$2¼ \times 4½ \times 1½ =$		.0963⅛
—			.084
			———

TABLE 68.—ARITHMETIC, ADDITION. EIGHTH GRADES. FOUR-TEACHER SCHOOLS. DISTRIBUTION AND MEDIAN SCORES FOR TWELVE COUNTIES BY SCHOOLS. WOODY STANDARD, 18.5

Score	Kinderbrook No. 1	Kinderbrook No. 2	Clavernack No. 6	Amherst No. 3	Hamburg No. 1	Newstead No. 3	Tonawanda No. 1	Tonawanda No. 1	Tonawanda No. 1	Buffalo No. 17	Clarence No. 8	Brasher No. 18	Wolcott No. 18	Wolcott No. 5	Rose	Rye No. 1	Rye No. 2	Rye No. 3	Scarsdale No. 1	Tuckahoe No. 2	Cherry Valley No. 1	Mexico No. 7	York	Rochester	Total
10	..	..	..	..	..	..	..	1	..	..	..	..	..	..	2	1	..	..	..	..	..	..	..	..	4
11	..	..	..	..	1	1	..	..	..	5	1	1	1	..	..	..	..	..	..	1	..	2	..	1	14
12	..	..	..	1	1	1	..	..	1	7	2	..	1	..	1	2	..	1	2	..	..	..	..	2	22
13	1	2	1	2	1	1	..	..	..	8	1	..	3	2	1	1	..	4	2	3	1	5	5	3	47
14	1	2	1	3	1	3	..	..	..	25	4	4	7	2	3	6	2	5	3	1	1	4	**10**	6	94
15	2	3	6	6	8	4	..	2	4	29	10	**1**	**10**	2	2	9	..	5	6	6	3	**7**	6	12	143
16	**3**	**4**	**8**	**5**	**7**	10	1	4	7	**38**	**8**	1	5	**4**	**2**	**11**	4	**5**	**9**	**3**	**2**	7	5	22	175
17	4	3	4	6	2	**7**	3	**1**	**4**	33	4	2	5	2	5	9	**2**	8	8	3	2	4	2	**20**	143
18	..	2	6	5	11	12	**5**	2	6	14	6	1	6	2	..	5	1	..	7	4	1	1	..	20	117
19	..	..	2	..	2	3	2	3	3	3	2	..	2	..	1	3	2	2	5	..	2	..	..	8	45
Total....	11	16	28	28	34	42	11	13	25	162	38	10	40	14	17	47	11	30	42	21	12	30	28	94	804
Median..	16.5	16.3	16.8	16.4	16.7	17.2	18.3	17	17.1	16.2	16.1	15.0	15.8	16.3	16	16.4	17	16	16.9	16	16.5	15.6	14.9	17.1	16.4

Results

The score in each of the tests is the number of problems having correct answers. For each of the two tests Woody has fixed standard scores for the beginning of the eighth grade (September) as follows:

Addition—18.5; Multiplication—18.

Inasmuch as the New York tests were given in April and May, after the pupils had had six months or more in the grade, the New York scores should exceed the Woody standards.

Table 69.—Arithmetic, Addition. Eighth Grades. Four-Teacher Schools. Distribution and Median Scores for Twelve Counties. Woody Standard, 18.5

Score	Names of counties												Total
	Cayuga	Clinton	Columbia	Erie	St. Lawrence	Tompkins	Wayne	Westchester	Otsego	Oswego	Livingston	Monroe	
10	..	..	..	1	..	..	2	1	..	..	..	..	4
11	1	..	..	8	2	..	1	1	..	2	..	1	16
12	..	..	..	13	..	..	2	5	..	..	..	2	22
13	1	..	4	13	2	1	6	11	1	5	..	3	48
14	..	..	4	37	4	1	12	17	1	5	5	6	92
15	1	1	11	64	3	1	14	26	3	7	10	12	153
16	4	3	15	81	3	3	11	32	2	7	6	22	189
17	2	1	11	61	2	2	12	30	2	4	5	20	152
18	..	1	8	62	2	..	8	17	1	1	2	20	122
19	..	1	2	18	1	..	3	12	2	..	..	8	47
Total....	9	7	55	358	19	8	71	152	12	31	28	94	845
Median...	16.4	17.0	16.6	16.5	15.5	16.3	16.0	16.5	16.5	15.6	15.9	17.1	16.5

How nearly this valid expectation is realized may be observed in Table 68, which gives the distribution for twenty-four schools, each of which had ten or more pupils in grade 8, and in Table 69, where the several schools of a county are gathered into single distributions. One-teacher schools are not included in either Tables 68 or 69.

The median score for the 845 eighth grade pupils in these larger schools is 16.5, almost two problems less than the Woody standard. (See Figure 35.) In fact this median score is but slightly more than

the sixth grade standard given by Woody. Only one among the twenty-four schools equalled in grade 8 the Woody standard for grade 7. The county groups merely combine the several schools within a single supervisory district and show essentially the same results.

TABLE 70.—ARITHMETIC, MULTIPLICATION. EIGHTH GRADES. FOUR-TEACHER SCHOOLS. DISTRIBUTION AND MEDIAN SCORES FOR TWELVE COUNTIES. WOODY STANDARD, 18

Score	Names of counties												Total
	Cayuga	Clinton	Columbia	Erie	St. Lawrence	Tompkins	Wayne	Westchester	Otsego	Oswego	Livingston	Monroe	
6	..	..	..	1	..	..	..	..	..	..	..	..	1
7	..	..	..	..	..	..	..	..	..	..	..	1	1
8	..	..	..	1	..	..	..	..	..	..	..	..	1
9	..	..	..	2	..	..	..	..	..	..	..	..	2
10	..	..	..	9	..	..	..	..	..	..	..	..	9
11	..	..	1	12	..	..	3	3	..	..	..	..	19
12	..	..	2	28	1	..	4	2	..	1	3	2	43
13	1	..	1	22	1	1	6	9	3	2	4	..	50
14	..	1	2	41	..	1	4	10	..	4	4	6	73
15	3	..	4	47	3	..	14	22	2	4	4	7	112
16	..	..	11	62	3	..	12	31	1	6	3	10	139
17	2	4	9	56	4	2	9	21	4	6	8	20	145
18	1	2	14	49	1	3	7	29	1	6	1	19	133
19	2	..	7	22	4	..	10	18	1	2	1	17	84
20	..	..	4	5	..	1	2	7	..	..	..	12	31
Total.....	9	7	55	357	17	8	71	152	12	31	28	94	843
Median...	17.5	17.6	17.8	16.3	17.1	18.0	16.4	17.0	17.0	16.8	15.8	18.1	16.8

The multiplication scores are given by counties only in Table 70. The median for the entire group of 843 pupils is 16.8, which is within one problem of the standard. The schools of Tompkins and of Rochester (Monroe) equal the standard and Clinton and Columbia approximate it. From the figures in this table one must regard the attainments of these schools in multiplication as normal and satisfactory.

In no phase of the examinations do the one-teacher schools achieve a showing so favorable as compared with that of the larger schools. As is apparent in Table 71, the smaller schools achieve

approximately the same results as the larger schools in grade 8 and fall short not to exceed one problem in grade 5.

The figures are given for these grades only. Additional data for the other grades and for the two- and three-teacher schools tell the same story and there seems little need for multiplying evidence. There is everywhere inferior achievement as measured by the Woody norm, but a good status as measured by the results of the

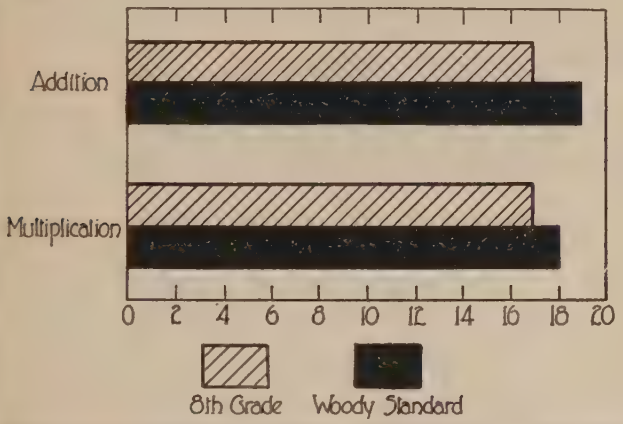

Figure 35.—Arithmetic, addition, multiplication. Four-teacher schools. Grade 8. Comparison of median scores with Woody Standards

test in other places. In what may be considered good city schools the pupils often fail to measure up to this standard so that the standard may be regarded as somewhat severe as a measure of what good schools are actually achieving. As desirable goals of achievement the Woody Standards may be accepted as ends to be attained, and the schools of New York would do well to strive to attain these standards.

TABLE 71.—ARITHMETIC, ADDITION. ONE- AND FOUR-TEACHER SCHOOLS. GRADES 5 AND 8. MEDIAN SCORES BY GRADES. WOODY STANDARDS

	Grade 5	Grade 8
One-teacher schools	13.4	16.2
Four-teacher schools	14.1	16.5
Woody standards, September scores	14.0	18.5

In addition to the Woody scales in the fundamentals, there are available the results of an arithmetical reasoning test of twenty problems. This is Exercise 2 of the Delta 2 Intelligence Examination (see Chapter VIII), which was given to all elementary school pupils. The results of this test in terms of median scores are shown in Table 72 for grades 3 to 8 inclusive. The data are given for small and large schools separately. As compared with the standard for the several grades both types of schools fall low in most grades. The smaller schools are uniformly lower than the larger schools although the difference in grade 5 is slight.

TABLE 72.—ARITHMETICAL REASONING: EXERCISE 2 OF INTELLIGENCE EXAMINATION, DELTA 2. ONE- AND FOUR-TEACHER SCHOOLS. GRADES 3 TO 8. MEDIAN SCORES BY GRADES

	Grades					
	3	4	5	6	7	8
Standard	5.0	7.0	9.0	10.5	11.5	13.0
One-room schools	3.9	5.5	6.6	9.0	10.4	11.3
Four-room schools	4.9	5.6	7.7	9.8	12.1	12.3

It would seem from the facts here presented that the New York schools in general achieve better results in teaching the fundamental operations in arithmetic than they do in teaching arithmetical reasoning. The latter is more difficult to teach, more difficult to find satisfactory drill exercises for, probably much more dependent on the native capacities of the pupils, but withal much more important as an acquisition for school children.

How distinctly superior are the reasoning achievements in the larger schools may be seen in Table 73, where the median scores for pupils in the two types of schools are given by ages. There is not a single age group represented in this table where there is less than a year's difference in favor of the larger schools. The ten-year-old in the larger school reasons better than the eleven-year-old in the smaller school and the twelve-year-old in the larger school better than the thirteen-year-old in the smaller schools. How significant

this difference of a year really is will be apparent to any one familiar with the facts of school elimination and of later opportunities for schooling.

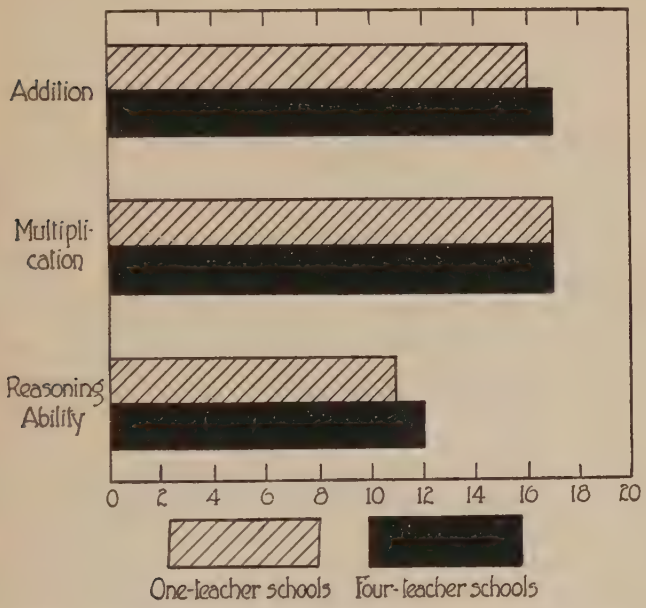

Figure 36.—Arithmetic: Addition, multiplication and reasoning. One- and four-teacher schools. Grade 8. Median scores

TABLE 73.—ARITHMETICAL REASONING: EXERCISE 2 OF INTELLIGENCE EXAMINATION, DELTA 2. ONE- AND FOUR-TEACHER SCHOOLS. GRADES 3 TO 8. MEDIAN SCORES BY AGES

	Ages in years											
	7	8	9	10	11	12	13	14	15	16	17	18
One-room schools..	3.0	3.8	4.8	5.6	7.4	8.3	9.3	9.4	10.5	9.9	..	..
Four-room schools..	5.8	5.1	6.6	7.6	8.4	9.8	10.7	11.6	10.05	10.4	10.7	..

CHAPTER XII

ALGEBRA

IT WILL be recalled that in selecting schools for testing all the schools of a supervisory district were included. In this way tests were given to all high school pupils of a district whether these pupils were found in large, well-organized high schools or in small classes connected with upper elementary grades in smaller schools. The achievements of these high school pupils in reading have already been noted. It remains to give the results from the algebra and Latin tests.

The algebra tests,[1] which were given to all pupils who had studied the subject three months or more and who, at the time of the test, were studying it, were those devised by Dr. H. G. Hotz. Two tests—Addition and Subtraction, and Equation and Formula, Series A—each requiring twenty minutes of the pupil's time, were given to about a thousand high school students. Sample problems from each of the two scales will make clear the nature of the test.

Equation and Formula

"Solve the following equations and formulæ:

1. $2x=4$.
6. $10-11z=4-8z$.
14. $3m+7n=34$
    $7m+8n=46$
23. $\frac{6x-2}{x+3}-3=\frac{3x^2+13}{x^2-9}$
25. $\sqrt{x^2-1}-x=-1$."

[1] Hotz, H. G.: Algebra Scales. Teachers College Bureau of Publications.

Addition and Subtraction

Carefully perform the operations as indicated.

1. $4r+3r+2r=$
10. $8c-(-6+3c)=$
15. $\frac{1}{a-x}-\frac{3x}{a^2-x^2}=$
23. $\sqrt{20}+\sqrt{45}+\sqrt{1/5}=$

The Hotz tests are based on the type of algebra prescribed in the New York Syllabus. For "elementary algebra" this syllabus covers the following topics:

Algebraic language
Elementary graphs
Negative numbers
Fundamental operations
Factoring
Fractions
Simple (linear) equations, both numeric and literal, containing one or two unknown quantities
Roots
Quadratic equations in one unknown
Simultaneous equations involving quadratics

Obviously, the tests call for no algebraic information or skill which is not provided for in the curriculum of the New York rural schools. The results of the tests may, therefore, be taken as a measure of the fidelity with which the schools follow this course of study and the efficiency with which the subject is taught.

The standards for these tests are based on the achievements of pupils in good city schools. The tests were used in the surveys of public schools in Virginia, North Carolina and Kentucky, and comparative scores from these states are given in Table 76, where may also be found the Hotz standards and the New York median scores.

Record was made of the time each pupil had studied algebra and the results are tabulated in terms of this time. Most of the students examined are included in the group which had studied algebra one school year or about eight school months. It was not always easy to determine this time element from the student's statement or even from that of the teacher or from the two combined. Many

students who were apparently repeating the subject reported the time of the first year and that of the current year combined. The teacher's record was based on the time the *class* had studied the subject. Wherever the records of the pupil and the teacher disagreed, the teacher's record, if at all clear, was accepted. In many cases the conflicting records were insoluble and the pupil's score was, therefore, discarded.

The time records finally accepted, in general, give an advantage to the New York schools. Thus, in Tables 74–75 are included some pupils who had studied algebra three months the previous year and eight months during the year the tests were given. Only this so-called 8-months group are here reported, since no material additional help is afforded to interpretation by the three, six, or twelve months groups.

In Tables 74–75 are given the distributions of scores for each of the two tests for the "8-months" group. The median scores for the several school groups given in this table are based on too few cases in many of the schools for any sweeping comment as to individual schools. The teachers at Ledyard, Kinderbrook No. 2 and Amherst might very well inquire, however, concerning the methods by which the schools at Parker, Scarsdale and New Haven accomplish superior results in addition and subtraction.

The median scores for the two types of schools, which are given together in Table 76, show that in general the larger New York schools are achieving satisfactory results in the fundamentals of algebra.

It will be observed in this table that the New York scores are consistently higher than those from Virginia, North Carolina and Kentucky rural schools. The larger New York schools not only exceed the records for all of these states, but exceed the Hotz standards by a slight margin in each of the two tests.

The table shows separately the scores for a junior high school in the city of Rochester, for one in the city of Buffalo and for the consolidated school at Greigsville. The results show that the larger rural schools are teaching the fundamentals of algebra as well as are those schools where the tests were given for the sake of securing comparative scores. If we admit that formal algebra of the tradi-

TABLE 74.—ALGEBRA; ADDITION, AND SUBTRACTION. NINTH GRADES. DISTRIBUTION AND MEDIAN SCORES FOR PUPILS WHO HAVE STUDIED ALGEBRA EIGHT (8–11) MONTHS

Score	Rochester	Springport	Ledyard	Greigsville	Keesville	Kinderhook No. 1	Kinderhook No. 2	Philmont	Amherst	Buffalo	Newstead	Parker	Brasher	Norfolk	Ulysses	Newfield	Wolcott	Rye No. 1	Eastchester	Rye No. 3	Scarsdale	New Haven	Mexico	Springfield Center	E. Springfield	Total
0	..	..	..	..	1	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2
1	..	..	..	..	1	..	..	..	1	2	..	..	..	..	..	..	..	..	2	..	..	..	..	..	1	7
2	..	..	2	..	1	..	..	..	..	7	1	..	4	..	2	2	5	3	1	1	..	..	..	1	2	32
3	4	..	**3**	..	2	..	1	..	**2**	6	..	..	2	1	5	2	2	..	1	2	..	..	1	..	..	34
4	8	1	..	..	1	1	1	1	1	7	1	..	..	1	3	2	..	3	3	5	4	..	..	1	2	46
5	4	2	..	4	2	..	**3**	8	..	3	6	..	4	2	2	**1**	1	3	**7**	5	5	2	2	**3**	**1**	70
6	**5**	**3**	..	4	**4**	1	..	**5**	..	**6**	4	3	1	2	2	2	**7**	**3**	4	**4**	2	..	**2**	2	3	69
7	8	1	2	**7**	1	**1**	..	5	1	9	**5**	5	**9**	2	**5**	1	5	7	3	4	**7**	..	1	..	..	89
8	8	..	..	1	..	..	..	2	..	5	5	1	4	**4**	4	1	2	1	..	3	6	1	1	..	1	50
9	5	..	..	..	..	1	..	4	..	2	5	**4**	2	..	2	..	..	1	1	2	1	**1**	..	..	..	31
10	1	..	..	..	..	..	..	..	..	3	3	4	1	1	..	..	1	..	1	..	1	1	..	..	..	17
11	..	..	..	..	2	..	..	1	..	..	..	..	..	1	2	..	..	..	..	..	..	..	..	..	..	6
12	..	..	..	..	..	..	..	..	..	..	..	1	1	1	..	..	..	..	..	..	..	1	..	..	..	4
Total....	43	7	7	16	15	4	5	26	6	50	30	18	28	15	27	11	23	21	23	26	26	6	7	7	10	457
Median..	7.0	6.2	3.5	7.0	6.0	7.0	5.2	6.8	3.5	6.0	7.6	9.0	7.4	8.0	7.0	5.0	6.5	6.5	5.7	6.0	7.3	9.0	6.3	5.5	5.0	5.5

TABLE 75.—ALGEBRA: EQUATION AND FORMULA. NINTH GRADE. DISTRIBUTION AND MEDIAN SCORES FOR PUPILS WHO HAVE STUDIED ALGEBRA EIGHT (8–11) MONTHS

Score	Rochester	Springport	Ledyard	Greigsville	Keesville	Kinderbrook No. 1	Kinderbrook No. 2	Philmont	Amherst	Buffalo	Newstead	Parker	Brasher	Norfolk	Ulysses	Newfield	Wolcott	Rye No. 1	Eastchester	Rye No. 3	Scarsdale	New Haven	Mexico	Springfield Center	E. Springfield	Total
0	..	..	..	..	1	..	..	..	..	2	..	..	1	..	1	..	..	3	..	..	..	..	..	..	1	9
1	..	..	3	..	1	..	..	..	..	1	..	..	..	..	1	1	..	1	..	1	..	..	..	..	1	10
2	..	..	..	..	4	..	..	..	..	8	..	..	2	..	1	..	..	1	2	..	1	..	..	..	..	19
3	..	1	1	1	2	..	..	1	1	4	1	..	2	..	2	2	2	1	..	..	..	..	1	2	..	24
4	4	2	..	2	..	1	1	2	1	7	1	..	1	..	3	1	1	1	1	1	2	1	..	..	1	34
5	2	**1**	1	2	..	1	1	4	**3**	**13**	4	1	5	4	**8**	2	8	..	1	1	4	..	2	1	1	70
6	7	1	2	1	1	..	**3**	**8**	1	7	6	2	**6**	2	3	**1**	**4**	**5**	3	6	4	..	1	**2**	**2**	78
7	**10**	..	..	**3**	2	**1**	..	6	..	3	**4**	6	4	1	4	3	..	4	2	**8**	**7**	**3**	**2**	1	1	74
8	6	2	..	2	**1**	..	..	3	..	3	3	**5**	2	**3**	3	1	7	3	**5**	4	4	1	1	1	1	61
9	10	..	..	1	2	1	..	2	..	1	3	4	2	5	1	..	1	2	7	4	1	..	..	..	1	48
10	4	..	..	3	..	..	..	..	..	1	5	..	2	..	..	..	..	..	2	1	3	1	..	..	..	22
11	..	..	..	1	1	..	..	..	..	..	2	..	1	..	..	..	..	..	..	..	..	..	..	..	1	6
12	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1
Total....	43	7	7	16	15	4	5	26	6	50	30	18	28	15	27	11	23	21	23	26	26	6	7	7	10	456
Median..	7.8	5.5	4.0	7.7	3.8	7.0	6.2	6.8	5.3	5.3	7.8	8.0	6.5	8.2	5.7	6.0	6.1	6.7	8.5	7.5	7.3	7.7	7.0	6.5	6.5	6.8

tional type is a proper subject for beginning high school pupils, then we may conclude that the pupils in these larger rural schools are being as well served as are pupils in good schools throughout the country.

TABLE 76.—ALGEBRA, HOTZ: ADDITION AND SUBTRACTION TESTS AND EQUATION AND FORMULA TESTS. MEDIAN SCORES FOR PUPILS STUDYING FOR 8 MONTHS

		Addition and subtraction	Equation and formula
Hotz standards		7.5	7.6
New York less than 4 teachers		5.8	6.0
New York 4 and more teachers		7.6	8.0
Rochester		6.1	8.2
Buffalo		6.1	5.3
Greigsville		7.1	7.7
North Carolina	Rural	3.7	4.2
	Large city	3.9	4.5
Virginia	Rural	5.2	4.6
	Large city	5.6	6.1
Kentucky	Rural	3.8	4.8
	City	5.0	6.0

Not so much, however, may be said for the pupils in the smaller schools. The discrepancy which appeared so markedly in the results of the elementary school tests appears also here. These smaller schools, while scoring better than schools of similar type in the other states represented in this table, are distinctly below the achievements of the larger rural schools in New York state, below the junior high schools in Rochester and Buffalo, below Greigsville, below the Hotz standard, and just about on a par with the larger Virginia cities. The reason for these inferior scores is not obvious from any data at hand. The fact, however, is clear. The pupils in these smaller schools are less efficient in their mastery of algebraic fundamentals as represented in the two Hotz scales used in this survey.

CHAPTER XIII

LATIN

LATIN is an optional study in New York high schools. It is, however, required for entrance to most eastern colleges. There are three college preparatory courses: one for the diploma in Arts, one for the diploma in Science, and one for the diploma in Engineering. Latin is required in the first course. In the State Department syllabus covering Latin, both vocabulary and the reading of "easy connected Latin" are stressed for the first two years. "This syllabus, then, while emphasizing for the first two years a definite Latin vocabulary and the study of English words derived from Latin, is also planned to help teachers *to equip their pupils to read Latin more understandingly and more readily than is usual at the present time.*"

"Mastery of vocabulary, mastery of inflections, mastery of the essential principles of syntax, are things greatly desired but not often attained. These features are emphasized and goals of attainment by half years are clearly set."

Vocabulary and Sentence Reading

A vocabulary of 250 words arranged under "verbs, nouns, etc.," is prescribed for each half-year. "It is recommended that at least once a month the words encountered in the text-book be checked on the syllabus list and thoroughly mastered. At the end of a given half-year it will doubtless be found that a large percentage of the syllabus words has been met in the text-book. The remaining words should then be mastered."

That a fair mastery of the prescribed vocabulary is expected may be gleaned from this quotation:

"If strong emphasis is laid upon acquiring this working vocabulary, the pupil should have at command 90 percent or more of the 1000 words laid down for the first two years."

In view of the emphasis thus placed upon Latin vocabulary and sentence reading by the course of study, and of the further fact that these elements are stressed by annual state-wide examinations, it appears that tests based upon these linguistic elements would reveal the efficiency of the teaching in these schools. As a measure of this product, use was made of the Henmon[1] vocabulary and sentence tests. The content of the vocabulary tests is derived from "239 words common to thirteen first-year books and to Cæsar, Cicero and Virgil." The sentence tests "contain no words not found in this standard vocabulary." The particular vocabulary tests used in the New York survey—Tests 1 and 2—consisted of 50 words, 41, or 82 percent, of which are contained in the New York syllabus for the first year. Should we apply the syllabus measure of accuracy, namely, 90 percent, to the entire list the average New York score would be 45 words correctly translated. Should we consider only the 41 words found in the New York syllabus the score would be 36.9 words per pupil or an accuracy percentage of 74.

Although the syllabus requirement for connected Latin is not so definite, almost all of the words of the sentence test are to be found in the New York list for the first two half-years, so that the material has probably all been covered once at the time of the tests.

For both the vocabulary and sentence tests, Henmon has published "standard scores obtained in June" for each of the four years of high school Latin so that the New York scores may be compared with the achievements of good schools in other parts of the country.

Results of Vocabulary Test

The distributions of scores for all the schools tested in thirteen counties are given in Table 77. The first fact outstanding from this table is the wide range of knowledge shown by the pupils in these schools. Almost everywhere the range is from less than twenty percent up to 70, 80, 90, and even 100 percent.

There are counties, such as Cayuga, Clinton, Otsego and Westchester, where the median achievement as measured in percentage

[1] Henmon Latin Tests, World Book Company, 1921. Journal Educational Psychology, Nov. and Dec., 1917, and March, 1920.

scores just about equals Henmon's June standards. With a month of school yet remaining it is fairly certain that these schools would exceed the standard score by the end of the year. On the other hand, it is highly doubtful if schools scoring a median of 50 or less in May will be able to reach standard quality in June.

TABLE 77.—LATIN: VOCABULARY TEST. LARGE AND SMALL HIGH SCHOOLS. GRADE 9. DISTRIBUTION OF PERCENTAGE VALUES. MEDIAN SCORES BY COUNTIES

	Cayuga	Clinton	Columbia	Erie	Herkimer	Oswego	Otsego	St. Lawrence	Tompkins	Wayne	Westchester	Monroe	Total
0–5	..	..	..	..	..	..	..	..	..	..	..	..	..
6–10	..	..	..	..	..	1	..	..	..	1	..	..	2
11–15	1	..	..	..	..	..	..	..	1	1	..	..	3
16–20	..	..	..	2	2	1	..	2	2	3	..	1	13
21–25	..	..	..	..	1	2	..	2	..	1	..	1	7
26–30	..	..	3	5	..	1	..	2	5	3	..	..	19
31–35	..	1	2	2	1	3	..	2	..	3	2	1	17
36–40	..	..	2	6	..	1	2	3	2	3	2	2	23
41–45	1	1	3	11	..	**2**	..	5	1	6	1	1	32
46–50	3	2	3	7	1	2	1	**4**	**2**	2	6	8	41
51–55	..	..	**4**	9	**1**	2	2	2	3	**7**	5	2	37
56–60	5	..	4	**7**	2	1	1	6	2	5	4	**6**	43
61–65	**6**	**2**	3	4	..	..	1	2	..	..	**5**	3	26
66–70	3	..	2	16	1	..	**1**	1	3	2	9	5	43
71–75	2	1	2	3	1	1	3	..	..	..	4	2	19
76–80	4	1	..	9	..	1	3	4	3	5	2	3	35
81–85	1	2	..	4	..	1	..	..	..	2	2	1	13
86–90	1	1	..	3	..	..	..	1	..	3	3	4	16
91–95	..	..	..	..	..	..	..	..	..	..	1	..	1
96–100	..	..	..	..	..	..	1	..	..	1	..	..	2
Total	27	11	28	88	10	19	15	36	24	48	46	40	392
Median	64	65	52	57	51	42	69	49	49	52	64	59	56

Sweeping generalizations must be cautiously made from the small number of cases reported for most districts. If one were disposed to argue from the cases of individual pupils, it would be possible to make a case even for a district with the lowest median

score. In Oswego county, with a median score for 19 pupils of 42 percent, there are three pupils who are conspicuously good. These three were all in one school. In other schools there were pupils of equal intelligence and of equal reading ability who scored 32, 34 and 48 in Latin. Were these excellent students not included, the median score for the group would drop to about 35. In Otsego county to take the highest-scoring group there is no pupil who scores so low as 35 and about half score up to 70 points.

An examination of the column showing totals, with a median score for the group of 56, and 84 pupils, or about one-fifth of all scoring less than 40 percent of correct responses, raises serious question as to the advisability of trying to teach Latin to these pupils. Even the most ardent advocate of the value of Latin would doubtless admit that high school pupils are hardly benefitted by being exposed to Latin unless they really learn to recognize the meaning of the basic Latin words. Judged by the criterion of this test, at least twenty percent of these pupils have spent a year on the subject with little or no actual achievement. Either these pupils should be effectively taught or they should apply their time to other things. On the other hand, there are many pupils who by the measure of the test do achieve good results. For them the teaching of Latin in these schools is effective.

If one is to judge the teaching of Latin vocabulary by the median scores of the several groups, the New York rural schools appear to teach less well than do the schools from which Henmon secured his standards. Only one district of the twelve listed in Table 77 has a median score equal to the norm. Three others approximate it, but whole districts score so low as to prevent any genuine comparison.

The situation is, of course, less favorable if one compares the actual scores with the New York expectancy of 90 percent of the words in the syllabus list, or of 74 percent of the entire fifty. Schools scoring fifty percent or less are, of course, too low to make comparison significant. To be sure, the pupils had yet a month of schooling and these medians might have proved higher at the end of the term. Putting the best possible interpretation upon them, however, the results are in no sense flattering to the Latin teaching in the rural schools.

Results of the Sentence Test

The all or none method of scoring the sentence tests inevitably renders the scores low. A sentence may be correctly translated in most of its elements, but if not correct throughout, the score for that sentence is zero. This method makes the scoring more objective and less dependent on the individual judgment of the scorer than would a method of allowing partial credits, but many Latin teachers feel that the partial credit method would be fairer to pupils and to the measurement of Latin teaching efficiency. Whatever justice may inhere in this argument, it remains true that the scores for the New York schools are directly comparable with Henmon's norms, since they are secured by the same method of scoring.

Table 78.—Latin. Sentence Test. Large and Small High Schools. Grade 9. Distribution of Percentage Values. Median Scores by Counties

	Cayuga	Clinton	Columbia	Erie	Herkimer	Oswego	Otsego	St. Lawrence	Tompkins	Wayne	Westchester	Monroe	Total
0–9	1	1	6	12	3	**12**	1	8	2	15	5	3	69
10–19	4	3	6	18	2	2	3	8	5	**12**	7	7	77
20–29	**15**	**3**	**11**	**40**	**4**	3	**7**	**14**	**12**	10	**19**	**17**	155
30–39	5	2	4	9	1	..	4	3	5	5	8	10	56
40–49	2	2	1	5	..	1	..	1	..	6	4	3	25
50–59	..	..	..	3	..	..	..	..	..	..	1	..	4
60–69	..	..	..	..	..	..	..	2	..	1	..	..	3
Totals.....	27	11	28	87	10	18	15	36	24	49	44	40	389
Medians...	26	25	22	23	20	8	25	21	24	18	25	26	23

The results for the sentence test are given in Table 78. Sixty-nine pupils or about one-sixth of all score less than 10 percent of correct translations, which means that they are not credited with a single correct translation. The median for the group is 23 percent

and only four school districts score fully equal Henmon's standard of 25 percent correct for June classes.

There are many students who in terms of the test are mastering connected Latin, almost one-half of all scoring equal to the standard. In one group of 44 pupils, only 12 fell below this mark and in another group of 40 only ten scored so low. On the other hand, there were 12 in a group of 18 who scored zero and in another group of 49 fifteen failed to make a single correct translation. Despite its lack of fine discriminative capacity the sentence test, therefore, shows the same type of condition revealed by the vocabulary tests—wide range of individual achievement, wide differences among the schools, and a Latin achievement for whole districts below acceptable standards of accomplishment.

TABLE 79.—HENMON LATIN TEST. FIRST YEAR HIGH SCHOOL PUPILS WHO HAVE STUDIED LATIN 1 SCHOOL YEAR, 8 TO 11 MONTHS. MEDIAN SCORES FOR VOCABULARY AND SENTENCE TESTS; ALSO STANDARD SCORES

	Vocabulary	Sentence
Henmon standards	66	25
New York expectancy	74	..
New York achievement	56	23
Rochester	59	30
Greigsville	55	28

Table 79 gives a summary statement of all the Latin tests in New York rural schools and provides comparative scores from Rochester and Greigsville. The tests were given in these last two schools for comparative purposes. In general, the rural schools are teaching Latin less well than are good schools throughout the country as measured by the sentence test, and less well than Rochester and Greigsville. This is particularly true when the ages of the pupils are considered. Rochester pupils with a median age of 14.8 years score better than the larger rural New York schools with a median age of 15.1 years.

CHAPTER XIV

LARGER SCHOOL UNITS

IN RECENT years the consolidated school has been widely recommended as an effective means for improving rural education, and in New York state as well as elsewhere considerable consolidation has taken place. The test results in the survey apparently justify such larger school units. Almost without exception the median test scores are higher in the larger schools than they are in the smaller one-teacher schools. Although these differences have already been stressed in the several chapters where the several tests are discussed, it is so important a matter that a further word may be justified. The matter may best be presented through the summary tables, some of which have been already presented in previous chapters, but the importance of which in this connection justifies a repetition here.

Intelligence Examination, Delta 2

Inasmuch as the intelligence examination, Delta 2, is probably the best single measure of all the factors involved in school efficiency which we have available, the results of this measure may be presented first. In Table 80 the median scores and the median ages are given for grades 3 to 8 inclusive for one-, two-, three-, and four-teacher schools.

Judged by the median ages for the several groups, the four types of schools represented in this table are very much alike. Third grade pupils in one-teacher schools and in two-teacher schools have median ages of 9.6 years. In the three-teacher schools they are .1 year older; in the four-teacher schools they are four-tenths of a year or nearly five months *younger*. In no grade, however, does the difference in median ages exceed five-tenths of a year, or six months

TABLE 80.—INTELLIGENCE EXAMINATION: DELTA 2. MEDIAN SCORES AND AGES BY GRADES OF PUPILS IN ONE-, TWO-, THREE-, AND FOUR-TEACHER ELEMENTARY SCHOOLS

Schools	Grades											
	3		4		5		6		7		8	
	Score	Age	Score	Age	Score	Age	Score	Age	Score	Age	Score	Age
One-teacher	26	..	44	..	65	..	81	..	94	..	101	..
Two-teacher	.. 31.5	9.6 ..	.. 47.7	10.5 ..	.. 63.2	11.9 ..	.. 85	12.8 ..	.. 96	13.4 ..	.. 108.5	14.3 ..
Three-teacher	.. 33.7	9.6 ..	.. 62	10.7 ..	.. 75.3	11.4 ..	.. 89	12.8 ..	.. 98	13.8 ..	.. 102.4	14.8 ..
Four-teacher	.. 39	9.7 ..	.. 57	10.7 ..	.. 75	11.8 ..	.. 91	12.8 ..	.. 104	13.6 ..	.. 115	14.6 ..
	..	9.2	..	10.5	..	11.6	..	12.5	..	13.5	..	14.4

for the several types of schools. In general the differences which do exist are due to the younger ages of the pupils in the larger schools.

If, however, attention is given to the median test scores the advantage is decidedly with the larger schools. In grade 3 the superiority is about 13 points as between the one- and the four-teacher schools. This difference is equal to about .7 of the growth which these pupils make in a year. When this advantage is combined with the younger age, it appears that the larger schools have the advantage of more than a full year of progress.

TABLE 81.—INTELLIGENCE EXAMINATION: DELTA 2. ONE-, TWO-, AND THREE-TEACHER ELEMENTARY SCHOOLS. GRADES 3–8. FOUR-TEACHER ELEMENTARY SCHOOLS AND ALL HIGH SCHOOLS. GRADES 3–12. MEDIAN SCORES BY AGES

	Ages in years													
	7	8	9	10	11	12	13	14	15	16	17	18	19	20
One-room elem. schools, grades 3–8	21	29	38	48	71	75	84	86	86	89	79	..	..	..
Two-room elem. schools, grades 3–8	23	28	39	48	63	85	85	90	101	90	..	..	..	..
Three-room elem. schools, grades 3–8	..	41	48	63	66	70	91	97	91	..	..	..	..	..
Four-room elem. schools and all high schools	43	41	58	68	79	93	99	115	125	132	142	132	127	137

While subject to slight variations in certain grades for the two- and three-teacher schools, the same facts appear for each succeeding higher grade. In grade 6, for instance, the point where a large elimination occurs in the one-teacher schools, the pupils in the larger schools are three-tenths of a year younger and score about six-tenths of a year better, making a difference of almost a full year. Due to the large elimination of older pupils in the one-teacher schools, the median age of seventh grade pupils is only six-tenths of a year greater than that of sixth grade pupils in these schools. Their low

scores for grades 7 and 8 are, therefore, not connected with the increased age which is their due. Were these older pupils here included, the median scores would be lower still. Despite this advantage, how-

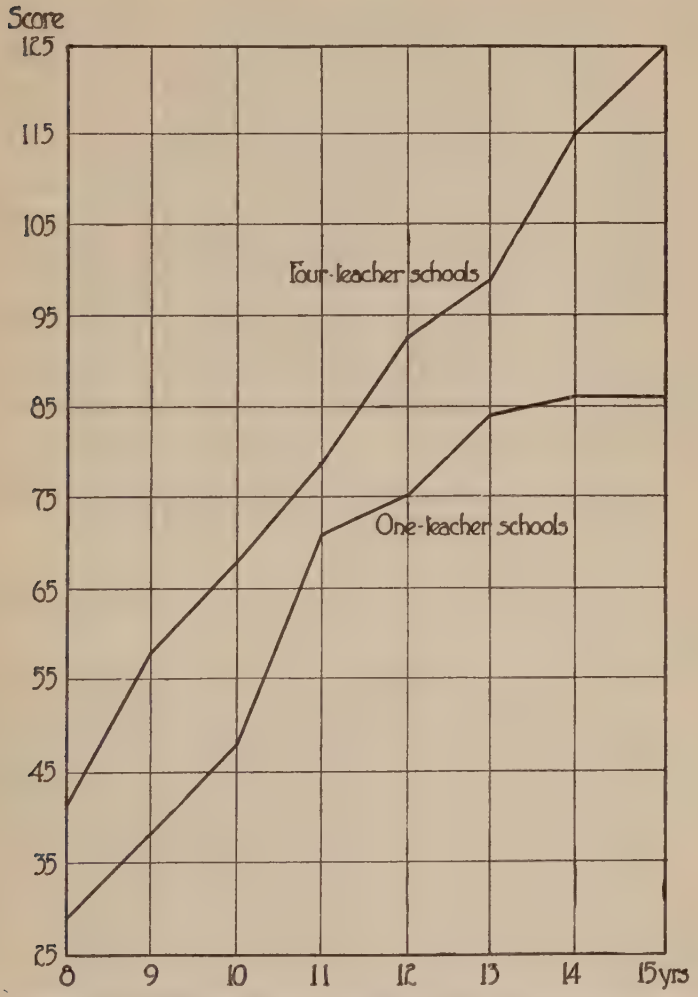

Figure 37.—Intelligence Examination, Delta 2. One-teacher elementary schools, grades 3–8. Four-teacher elementary schools and all high schools, grades 3–12. Median scores by ages

ever, the eighth grade pupils in these smallest schools score but 101 points, which is less by 3 points than the seventh grade score in the larger schools which have retained a larger percentage of their older pupils.

The superiority of the larger schools stands out even more clearly when the age of the children rather than the school grades is made the basis of the grouping. This is done in Table 81, using the same data as were used in Table 80. If one age group here shown may be regarded as more unselected than another, it is age 12. For this age the difference in score is 18 points, which is greater than the difference between the medians of grades 5 and 6 in any of the four types of schools shown in Table 80. To be sure the figures for the larger schools as given here include high school pupils. However, almost none of the 12-year-olds are in high schools. The comparison is, therefore, between two types of elementary schools, and the difference in favor of the larger school is in excess of the difference between the two school grades in which most of these pupils are found. (See Figure 37.)

TABLE 82.—INTELLIGENCE EXAMINATION: DELTA 2. ONE- AND FOUR-TEACHER ELEMENTARY SCHOOLS. GRADES 3 TO 8. PERCENTILE SCORES

Grades		Lowest score	10	20	30	40	50	60	70	80	90	100	Median	Total cases
3	One	0	9	14	17.5	22.5	26	29	34	40	48.5	83	26	446
	Four	1	19.5	25	30	35	39	44	49	56	68	98	39	412
4	One	0	20	24	33.5	38.5	44	49.5	55	61.5	70	108	44	526
	Four	1	28 5	37.5	46	53	57	62	67.5	76	87	118	57	728
5	One	6	34	48	54	59.5	65	69.5	74.5	80	90	123	65	460
	Four	1	42	52.5	61	68.5	75	81	90	95	103	135	75	669
6	One	21	48	63.5	69.5	76	81	90	97.5	98.5	107	135	81	480
	Four	21	61.5	69	75	82	91	99.5	102.5	108.5	118	145	91	713
7	One	31	65	76	83	89.5	94	97	103	109	120	163	94	290
	Four	26	74.5	86	93	99	104	110	115	121	128.5	158	104	587
8	One	51	83.5	88	92.5	96	101	105	110	116	122.5	143	101	302
	Four	56	92	99	105	110	115	120	125	131	139	163	115	566

For the sake of emphasis the data may be presented in the form of percentile scores. This is done for the one- and four-teacher

schools in Table 82. The figures across the top of the table indicate the percentile points and the figures in the body of the table show the score at each percentile for the several grades indicated on the left of the table. The medians and the number of cases are indicated at the right. Almost any way this table is read—by lowest score, by highest score, by median, or by the score for any percentile group—the larger schools are shown to be superior.

Reading Examination, Sigma 3

If we turn to the results of the reading test, the story is essentially the same as may be observed in Table 83. Grade for grade, the larger schools exceed the norm, and grade for grade, with one exception, the smaller schools fall short. As in the case of the intelligence test the difference between the two types of schools is about the equivalent of a year of progress.

Table 83.—Reading Examination: Sigma 3, Form B. One-, Two-, Three-, and Four-Teacher Elementary Schools in All Counties. Four-Teacher Schools Include All Schools with Four or More Teachers. Median Scores and Median Ages for Grades 5–8

Types of schools	Grades							
	5		6		7		8	
	Score	Age	Score	Age	Score	Age	Score	Age
One-teacher	31.5	..	41.7	..	55.3	..	65.8	..
	..	11.9	..	12.3	..	13.4	..	14.4
	28.9	..	49.3	..	53.9	..	72.5	..
Two-teacher	..	11.7	..	12.7	..	13.9	..	14.4
	40.4	..	49	..	65.5	..	71	..
Three-teacher	..	11.9	..	11.9	..	13.6	..	14.6
	41.6	..	55	..	70.5	..	80.7	..
Four-teacher	..	11.7	..	12.6	..	13.5	..	14.3
Norm	31		50		68		76	

In Table 84 the scores in the upper grade reading test are given in terms of the ages of the pupils. Ten-year-old pupils in one-room schools are here shown with a median score of 38 and in the four-teacher schools with a score of 56. This difference of 18 points is more than a year's improvement. The difference for other ages is not so great, but it is constant throughout the table, showing a uniform superiority of the larger school units in developing reading

TABLE 84.—READING EXAMINATION: SIGMA 3, FORM B. ONE,-TWO-, AND THREE-TEACHER ELEMENTARY SCHOOLS. GRADES 5–8. FOUR-TEACHER ELEMENTARY SCHOOLS AND ALL HIGH SCHOOLS. GRADES 5–12. MEDIAN SCORES BY AGES

	Ages									
	10	11	12	13	14	15	16	17	18	19
One-room elem. schools, grades 5–8	38	42	45	67	68	62	67	59	66	..
Two-room elem. schools, grades 5–8	29	37	54	45	46	61	..	..	..	..
Three-room elem. schools, grades 5–8	48	41	48	54	57	51	46	..	..	..
Four-room elem. schools and all high schools	56	57	63	71	79	82	93	110	105	111

ability on the part of pupils. The figures of Table 84 are shown graphically in Figure 14. The horizontal lines marked 5, 6, 7, 8, respectively, represent for these grades the probable median achievements in average schools. The full drawn curve represents by ages the achievements of pupils in the larger schools. The dotted line shows the results for the one-teacher elementary schools.

COMBINED SCORES

The scores for the intelligence and reading examinations combined are shown in Table 88, with the same obvious advantage in the larger schools. The bar diagram, Figure 38, makes the differences graphic.

TABLE 85.—INTELLIGENCE EXAMINATION, DELTA 2, AND READING EXAMINATION, SIGMA 3, COMBINED SCORES. ONE- AND FOUR-TEACHER ELEMENTARY SCHOOLS, GRADES 5 TO 8, AND SMALL AND LARGE HIGH SCHOOLS, GRADE 9. MEDIAN SCORE FOR EACH GRADE

	Grades				
	5	6	7	8	9
Small schools	95	122	148	166	208
Large schools	115	144	174	196	221

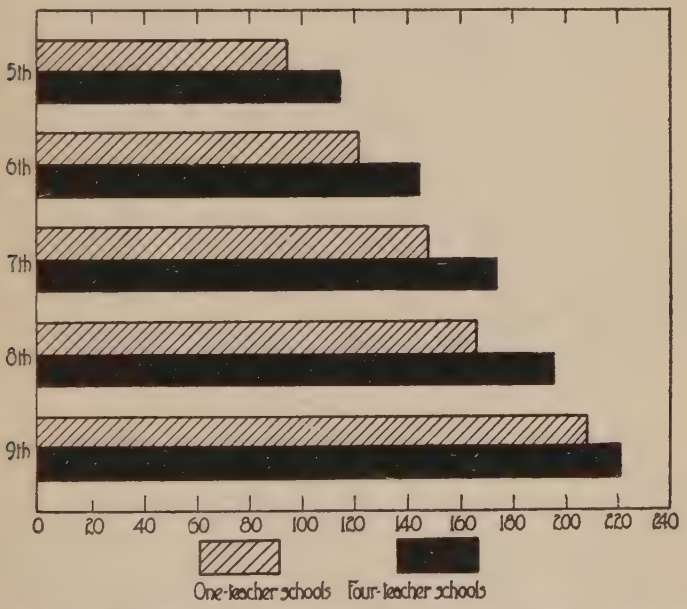

Figure 38.—Intelligence Examination, Delta 2, and Reading Examination, Sigma 3, Form B, combined scores. One- and four-teacher elementary schools, grades 5 to 8, and small and large high schools, grade 9. Median scores by grades

ACHIEVEMENT SCORES

That the evident difference between the larger and smaller schools is not due to the nature of the intelligence and reading

examination will be seen in Table 86, which gives the scores for all the available tests in grades 5 and 8. The interpretation deriving from this table is clearly the same as that already given. The larger school unit is obviously the superior educational institution—superior by at least one-eighth of the amount of education which children obtain in the entire elementary school.

Only one exception to this generalization holds—the scores in multiplication. These are the same for the two types of schools. For additional arithmetical problems, however, this does not prevail, the larger schools achieving superior results.

TABLE 86.—ONE- AND FOUR-TEACHER SCHOOLS—COMPARISON OF MEDIAN SCORES IN FIFTH AND EIGHTH GRADES

	Eighth grade		Fifth grade	
	One-teacher	Four-teacher	One-teacher	Four-teacher
Ages	14.4	14.3	12.0	11.7
Reading	66	81	32	42
Spelling	74	84	12	14
Addition	16	17	13	14
Multiplication	17	17	13	13
History information	31	39	..	..
History thought	29	37	..	..

CONFIRMING EVIDENCE

The conclusion from the results of the survey is, in general, confirmed by the results of a state-wide testing program carried on by Dr. J. Cayce Morrison, of the New York State Department of Education, at the instance of the Department of Rural Education of the National Education Association. The tests used were all different from the ones used in the survey, and the method of giving and scoring much less standardized and controlled. The larger schools also differed from the ones included under that name in the survey inasmuch as they were all consolidated schools.

By permission, the following is quoted from the report: "The difference in amount of achievement between the two types of schools considered in this investigation is relatively small. There

was, however, a *distinct and fairly consistent superiority on each of the several tests of the consolidated group over the one-room group.* When compared with the amount of gain that should be made from grade to grade, the excess of the consolidated group over the one-room group was most noticeable in language and spelling and least noticeable in arithmetic."

Primary Grades

That the distinction between the two types of schools is not an incident of the upper grade curriculum and the lack of teaching efficiency at this point in the course is evident from the scores made by the lower grades in silent reading. The scores in the Sigma 1

Table 87.—Reading Examination: Sigma 1. One-Teacher and Four- or More-Teacher Schools. Percent of Pupils Making Standard Norm in Grades 1, 2, 3, and 4

	1	2	3	4	Average
One-teacher	14	19	19	13	14
Four-teacher	25	27	33	31	29
All	20	23	27	23	23

Table 88.—Reading Examination: Sigma 1. Median Scores of Pupils in One- and Four-Teacher Schools by Ages

	Ages in years						
	5	6	7	8	9	10	11
One-teacher	0.0	2.3	5.1	11.1	22	24	26
Four-teacher	1.6	3	8.6	17	28	28	28
Standard age norms	..	6	10	19	27	33	43

test show exactly the same type of superiority for the larger schools. Table 88 gives the median scores for pupils of ages 5 to 11 for the one- and four-teacher schools. At no age are the pupils in the one-teacher schools equaling the achievements in the larger schools. This fact is confirmed by Table 87, which shows the percent of pupils in each grade who attain the standard for the test. Nowhere do 50

percent of these pupils achieve the standard score, but in every grade the percentage for the larger schools is practically double that for the smaller schools.

When such deficiency of achievement exists thus early in the elementary school it is small wonder that the upper grades show the discrepancies that they do.

High Schools

The comparative figures for large and small high schools do not mean the same type of thing as the comparison of large and small elementary schools. Many of the small high schools are connected with elementary schools of three and four rooms. Nor is the difference so obvious. In the Miller and Delta 2 examinations (see Tables 89–91), neither group of schools has any clear advantage.

Table 89.—Miller Mental Ability Test: Small and Large High Schools. Grades 9–12. Median Scores and Median Ages by Grades

	Grades							
	9		10		11		12	
	Score	Age	Score	Age	Score	Age	Score	Age
Small high schools	65	..	78	..	80	..	88	..
	..	15.4	..	16	..	17.2	..	18.1
Large high schools	67	..	74	..	80	..	86	..
	..	15.2	..	16.3	..	17.1	..	17.9

Table 90.—Miller Mental Ability Test: Small and Large High Schools. Grades 9–12. Median Scores by Ages

	Ages in years									
	12	13	14	15	16	17	18	19	20	21
Small high schools	65	72	74	73	74	74	70	75	..	..
Large high schools	68	74	74	73	74	75	74	74	76	..

TABLE 91.—INTELLIGENCE EXAMINATION: DELTA 2. MEDIAN SCORES AND AGES BY GRADES OF PUPILS IN SMALL AND LARGE HIGH SCHOOLS

Schools	Grades							
	9		10		11		12	
	Score	Age	Score	Age	Score	Age	Score	Age
Less than four-teacher	122	..	130	..	136	..	137	..
	..	15.4	..	15.9	..	17.3	..	18
Four-teacher	125	..	135	..	136	..	141	..
	..	15.1	..	16.3	..	17.1	..	17.9

The larger schools have a slight advantage in reading, as shown in Table 92.

TABLE 92.—READING EXAMINATION, SIGMA 3, FORM B. SMALL AND LARGE HIGH SCHOOLS. MEDIAN SCORES AND MEDIAN AGES FOR GRADES 9 TO 12

Schools	Grades							
	9		10		11		12	
	Score	Age	Score	Age	Score	Age	Score	Age
Small schools	90	..	104.5	..	107.1	..	111.7	..
	..	15.4	..	15.9	..	17.1	..	17.9
Large schools	94.6	..	103	..	111.5	..	118	..
	..	15.1	..	16.3	..	17.2	..	17.8

EVIDENCE FROM OTHER STATES

The superiority of the larger school unit thus apparent in the results of the New York tests is supported by results found elsewhere. The same differences appeared in the Virginia, North Carolina and Kentucky surveys, and in fact wherever the two types

of schools have been measured by the same tests. The constancy of this difference is such as to identify these smaller schools with inferior achievement and to raise in the mind of every patron of the one-room schools the desire for an improvement of school conditions.

Causes of Superiority of Larger Schools

Mere size of the school is hardly to be credited with this difference in scores. One inference which is easy to make from the test results is that the pupils attending the smaller schools are less intelligent than those attending the larger schools. The results of the intelligence tests would seem to indicate this, and it may be that there are a larger number of intelligent children in the villages and towns. The evidences on this point, however, are not conclusive, since there is good reason to believe that superior school training will enable a child to increase his score by a mere increase of reading efficiency without any alteration of native capacity. Much remains to be done in perfecting the discriminative quality of tests before they will give conclusive results on this point.

Even were this difference in intelligence a demonstrable fact, the necessity for securing a good educational product in these schools would still remain. The desirable standard of school achievement is not determined by the general level of native intelligence of a community but by the complex conditions of modern social life. The situations which a man must face in this modern world are not rendered any less difficult of solution by the fact that he is less intelligent than his neighbor. If he is so handicapped, the school which trains him to play his part in the world must be even more efficient than were he of higher native ability. The standards of school achievement are, therefore, set by the demands of life and if it should in the end prove true that the pupils in rural communities were handicapped by lower native ability, then the necessity for superior schools would be even greater than otherwise.

That superior educational advantages easy of identification accompany the larger school unit there can be no doubt. Better buildings, better equipment, better teachers, better classification of pupils, better school instruction, are all made possible by the union of interests, the increase of school revenue, the better school admin-

istration and supervision, consequent upon increase in the size of the school.

Let us consider, for example, one factor which all will admit is important in determining the product of any school, namely, the training of the teacher. A careful record was made in the case of every school tested of the amount and kind of training of every teacher whose pupils were examined. A study of these records shows that in the larger schools the median training of elementary teachers is two years beyond a four-year high school course, and that 44 percent of these teachers are graduates of a two-year normal course. On the other hand, only 9 percent of the teachers in one-room schools have two years' normal training and the median training of these teachers is four years of high school work plus summer courses of six weeks or more in normal schools.

Morrison's study already referred to shows the same advantage accruing to the larger schools in the way of better trained teachers. His report shows that only 24 percent of the teachers in his one-teacher schools had training equivalent to two years above high school graduation, whereas in the larger schools 65 percent of the teachers had this much training. One may be inclined in the light of this information to attribute the difference in results from the two types of schools to this difference in the training of the teachers. Even though this admission were made, the handicap of the one-teacher schools would still remain, since under prevailing conditions they seem unable to attract the better trained teachers.

Whatever the detailed cause may be, however, the fact remains that the one-teacher school is a less productive educational institution than is the larger school unit, and the pupils who attend the smaller schools are being handicapped for life by this fact. If the state of New York is to secure to the pupils of these more isolated regions an educational opportunity fairly equivalent to that now available to the children who attend the larger schools, it must change and improve these conditions. It is probable that the most effective means for such improvements is consolidation of school districts wherever that is possible. Where such enlarging of the school district is not feasible, heroic efforts should be made to bring to these smaller schools the necessary conditions for improved work at whatever cost.

SURVEY OF NEW YORK STATE RURAL SCHOOLS

THE survey was organized with the following sections and directors:

Administration and Supervision. C. H. Judd.
School Support. Harlan Updegraff.
Teachers and Courses of Study. W. C. Bagley.
School Buildings. J. E. Butterworth.
Measuring the Work of the Schools. M. E. Haggerty.
Community Relations. Mabel Carney.

The results of the studies conducted by these directors and their associates have been embodied in a series of reports. The approximate dates at which these will be available for distribution are:

Volume I. **Rural School Survey of New York State.** (Preliminary Report) May, 1922.

Volume II. **Administration and Supervision,** October, 1922.
The District System. Shelby.
The Supervisory District. Brooks.
The Community Unit. Works.
Principles of Administration. Bobbitt.
The State System of Examinations. Kruse.
Health Education. Peterson.
The State Schools of Agriculture. Holton.
Junior Extension. Holton.
Summary and Recommendations. Judd.

Volume III. **School Support.** Updegraff. August, 1922.

Volume IV. **Teachers and Teacher Preparation.** Bagley. September, 1922.
Elementary School Curriculum. Brim.
Community Relations. Carney.

Volume V. **School Buildings.** Butterworth. June, 1922.

Volume VI. **The Educational Product.** Haggerty. July, 1922.

Volume VII. **The Rural High Schools.** Ferriss. August, 1922.
(The administrative features of the high school were studied in coöperation with Dr. Judd, while teachers and curricula were developed under the general direction of Dr. Bagley.)

Volume VIII. **Vocational Education.** Eaton. July, 1922.
(Prepared under the direction of Dr. Bagley.)

These volumes may be obtained at seventy-five cents each, postpaid, except Volume II, on Administration and Supervision, which will be one dollar. Only a limited edition will be printed and those wishing to make certain of securing copies may place their orders at any time.

Joint Committee on Rural Schools,
Ithaca, N. Y.